MECHANICAL HANDLING

INCORPORATING 'MATERIALS HANDLING'

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50,000 MILLION MILES

DURING 1958 world air traffic covered well over 50,000 million passenger miles and nearly 1,200 million cargo ton miles, showing an increase in five years of over 20,000 million passenger miles alone. These colossal figures serve to show the tremendous part that aircraft play in the modern world, but as impressive as these figures may be they are almost eclipsed by the change that has taken place only within the last 12 months, in the world air transport industry. Claimed as the biggest step forward in its history the introduction into service of jet airliners in comparatively large numbers has seen the start of regular flying speeds of 600 m.p.h. against the 350 to 400 m.p.h. of the turbo prop and piston engined machines. More new types of jet airliners are scheduled to come into service shortly, and within the next five years it would seem possible that jet transport will predominate.

While attention is focused on this remarkable change in the pattern of air transport, as well as other achievements in the industry, it is not difficult to appreciate the major contributions that have been made by a vast army of scientists, engineers, designers and many others who are directly engaged on the production of aircraft; on the other hand, the invaluable contribution that is made by manufacturers of ancillary equipment tends to be overlooked. There could not however have been any doubts in the minds of those who visited the recent exhibition at Farnborough as to the indispensable part played by British manufacturers in support of an industry whose exports in 1959 are expected to exceed 175 million pounds in value. In support of this exhibition it is interesting to note that our associated journal *Flight* published a reference directory containing the aims of no less than 550 United Kingdom firms who are manufacturers or suppliers of equipment to the aircraft industry.

Mechanical handling and materials handling equipment comes into use in the industry in every branch and at every phase during the life of an aircraft. It is in the factory of the aircraft manufacturer, in the factory of the ancillary equipment manufacturer, it helps to handle and service the aircraft, it loads and unloads freight, it assists the passenger to embark and disembark, transports their baggage, helps to refuel the aircraft and is used extensively when the aircraft comes to the end of its life and is due for dismantling. Without it the latest product of the aircraft industry, the guided missile, would be useless.

A great deal of mechanical handling equipment used in connection with aircraft at all stages has been selected from manufacturers' standard products, on the other hand much has been designed to meet special purposes. Whatever the requirement may be there can be no doubt that the mechanical handling industry is ready to meet it, but we would suggest that it is quite capable of making a far greater contribution to the efficient production and operation of aircraft than it is doing at the present, if those concerned would only take better advantage of the accumulated knowledge, experience and skill that is readily available to any who require it.

Pour les lecteurs de l'étranger
Für unsere ausländischen Leser
Para los lectores de ultramar

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INHALTSÜBERSICHT AUF DEUTSCH

traditionellen Sack gehen die Müllereibetriebe in zunehmendem Masse zum Strassen- und Schienentransport ihres Mehls im ungesackten Zustand über. Eine der letzten Firmen, die sich auf den ungesackten Massentransport umgestellt haben, ist ein Unternehmen in der Grafschaft Cumberland, bei welchem kürzlich eine automatische Überkopfförder- und Austragsanlage fertiggestellt wurde. Die Anlage hat Sammelbehälter mit einem Mehlfassungsvermögen von 350 t sowie Ausladebehälter für bis zu 14 225 kg Mehl.

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Dieser Artikel beschreibt eine vollständige fahrbare Siebanlage. Diese besteht aus einem Sieb mit 2 Siebböden, einem 0,6 m breiten Lader, zwei 9,1 m Trogbandabsetzförderern in Rohrkonstruktion sowie einem 10 kW-Diesel-Wechselstromgenerator für eine 400V, 50 Hz. Drehstromversorgung.

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Materialfluss und Handhabung Seite 544
Von L. W. Bailey, F.R.Econ., A.M.I.Prod.E.
Dieses Referat wurde bei einem Betriebsleitungskursus im Wadham College, Oxford vorgelesen. Es beschreibt, auf welche Weise Verbesserungen des Materialflusses und Anlagen-Layout eines mittelgrossen Betriebes für die Herstellung von Haushaltsbürsten erzielt werden konnten.

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Elaboración de barras largas por etapas integradas Pág. 502
Una Compañía especializada en la producción de barras de acero pretensionadas y tratadas por el procedimiento aumentador de la resistencia a la tensión ha instalado una nueva planta en su fábrica de Sheffield. Esta planta es modelo del tratamiento continuo totalmente integrado con manipulación mecánica en todas las etapas.

Elevación mecánica de zamarras de aluminio Pág. 505
La manipulación de zamarras de aluminio mayores y más pesadas ha resultado posible ahora en la fábrica de Northern Aluminium Co., Ltd., gracias a la instalación de dos dispositivos mecánicos de elevación construídos por George W. King, Ltd., los cuales manipularán zamarras de una longitud que llega a 26 metros, solas y en paquetes.

Harina a granel Pág. 508
Al ir disminuyendo el número de las pequeñas panaderías y decrecer por consiguiente la demanda de harina en su tradicional saco, las fábricas de harina han ido adoptando métodos de almacenaje a granel de la harina, así como el transporte de la misma también a granel en vehículos de carretera y de ferrocarril. Una de las que más recientemente se han convertido a los métodos de almacenaje a granel es una firma del Condado de Cumberland, en el norte de Inglaterra, que recientemente terminó la instalación de una planta transportadora elevada automática de almacenaje y descarga, en su almacén. Dicha planta tiene sus grandes silos de almacenaje con capacidad de 305 toneladas métricas de harina, y silos para descarga cuya capacidad es de 14.224 kilogramos.

Transportadores en una nueva fábrica de comestibles Pág. 510
Una marcha continua de los materiales hacia adelante en todos los procesos de producción, y la paletización 100% en depósitos y almacenes, son el punto a que ha llegado la empresa Heinz en su fábrica de Kitt Green. So afirma que ésta es la más grande fábrica de comestibles en la Comunidad Británica de Naciones.

Almacén de entretenimiento ambulante Pág. 523
Por Leonard E. Bunnett, M.I.Prod.E.
El almacenaje eficiente de repuestos para entretenimiento presenta problemas que son diferentes de los relacionados con los repuestos de fabricación, y si además se trata de una instalación que tiene que estar en movimiento día y noche todo el año los problemas a que da origen son más difíciles de resolver, debiéndose proyectar con mucha precisión y ejecutar con estricta disciplina.

Sexto curso anual de capacitación para manipulación de materiales Pág. 525
Informe sobre el curso de capacitación que tuvo lugar en Lake Placid, en los Estados Unidos, y al que asistieron 53 estudiantes procedentes del Canadá, Inglaterra, Irlanda, Noruega, España, Holanda y Venezuela.

Planta cribadora móvil circular para coque Pág. 526
Por H. M. Lawrence, M.A., M.I.Mech.E., A.M.Inst.Gas E.
Damos una descripción de una planta cribadora móvil completa ejecutada según proyecto del Southern Gas Board. Consta de una unidad cribadora de dos pisos, una cargadora de 60 cm de ancho, dos empiladoras tubulares a correa de concavidad central que miden 9,10 metros, y un grupo diesel-alternador de 10 kW que produce corriente trifásica de 50 c/s a 400 voltios.

Almacenaje por unidades flexible Pág. 529
Por T. W. Highgate
Existe ahora en Inglaterra lo que se afirma constituir un nuevo y sin igual sistema de almacenaje flexible por unidades. Consta este sistema de una diversidad de receptáculos de carga unitaria de un tipo de caja metálica mejorado, cuyas dimensiones e ingeniería han sido calculadas de tal modo que el sistema resulta adecuado para manipular una extensa diversidad de materiales.

Manipulación de materiales Pág. 544
Por L. W. Bailey, F.R.Econ.S., A.M.I. Prod.E.
Se trata de una comunicación que fué leída en un curso de práctica administrativa en el Colegio de Wadham en Oxford. Describe cómo fueron logradas mejoras en los métodos de manipulación de materiales, así como el trazado de las instalaciones en un establecimiento de dimensiones medianas dedicado a la fabricación de cepillos para el hogar.

INTEGRATED LONG BAR PROCESSING

Techno Conveyor Plant at McCalls Macalloy

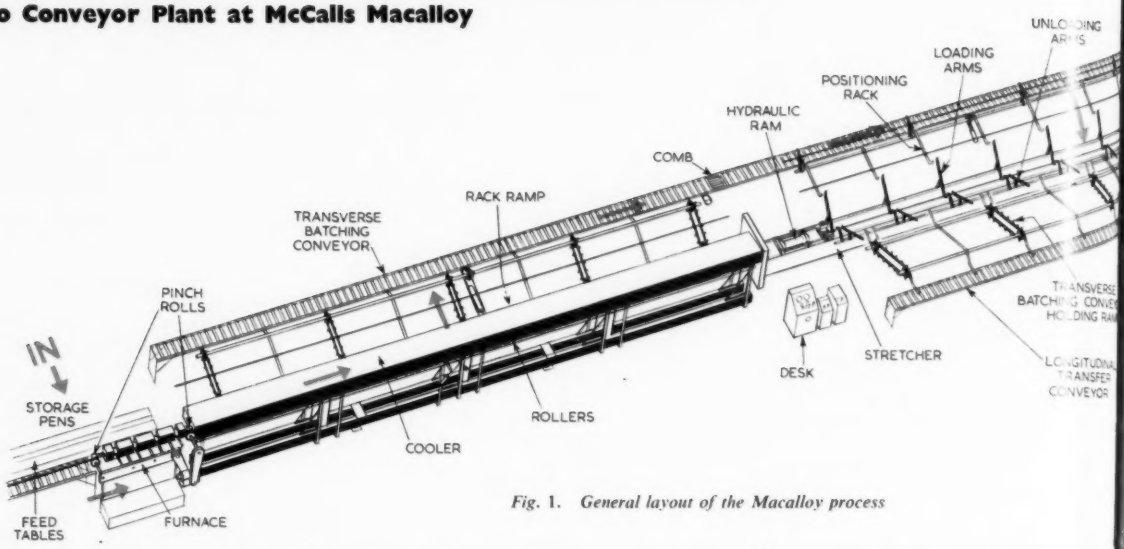


Fig. 1. General layout of the Macalloy process

McCalls Macalloy, ltd., have celebrated their tenth year of successful commercial exploitation of their patented prestressed steel bar by the installation of a new plant at their Sheffield works, an installation which is a model of fully integrated continuous processing with mechanical handling through all stages designed and constructed by Techno Handling, Ltd., in collaboration with McCalls.

McCalls have a long history in the manufacture of reinforcements for concrete structures and duly participated in the general application to them of prestressing. From 1947 to 1950 they pursued an original project jointly with the United Steel Cos,, Ltd., and consulting engineer Donovan H. Lee for the development of a steel improved to a particular point by cold work in the form of stretching, from which arose the patent Lee-McCall stressing system. In general terms this has four components: (1) the use of a suitable steel which proved to be already fairly widely known as silico-manganese spring steel, EN45; (2) a carefully calculated degree of pre-stretching; (3) the provision of a means of gripping on the bar ends such as threads to enable the bar to be placed under tension on the concrete system; (4) and finally hydraulic jacking, gripping collars, sole plates and other equipment to tension the bars in the final concrete assembly. The essential advantage of the Lee-McCall process is the use of low alloy steel which can be provided over long lengths with a high tensile strength without heat treatment, i.e. by the stretching form of cold work.

The new plant laid down in Sheffield replaces the original prototype set up for the process on which have been manufactured more than a quarter of a million highly successful prestressed bars during the last 10 years. The present replacement carries out the following operations: (*a*) Accelerated ageing and stress relieving; (*b*) cooling; (*c*) stretching; (*d*) sawing to length; (*e*) threading; (*f*) testing, if specially required; (*g*) bundling.

Design requirements of the New Plant

It will be appreciated the most difficult part of the project was the handling of bar stock through continuous processes in the great lengths demanded, viz. 60-65 ft in diameters ranging from $\frac{7}{8}$ to $1\frac{1}{4}$ in. Another drawback which limited the arrangement of the layout was the shape of the shop which was extremely long and narrow and of irregular width, further interrupted by the rail track to deal with incoming and outgoing bar stock. In addition the process centred around the expectation that the initial heating should be solely an accelerated ageing and stress relieving operation, not heat treatment in the conventional sense, and that the bars should be completely cold by the time they arrived at stretching, involving a considerable 'dwell' at the cooling bank. An important factor affecting the design of the equipment very considerably was the delivery of bars in separate batches which would necessarily have those slight variations from batch to batch in analysis requiring consequent variations in the length of stretch applied, so that the material had to be moved through the whole system in batches. These and other requirements are reflected in the design of the plant.

General Route

This consists of:—

(*A*) Transverse feed between (1) an incoming rail track (2) storage pens; (3) feed tables.

(*B*) Forward feed from the latter through (4) furnace; (5) cooling chamber.

(*C*) Transverse feed between the latter and (6) transverse batching conveyor; (7) longitudinal transfer conveyor.

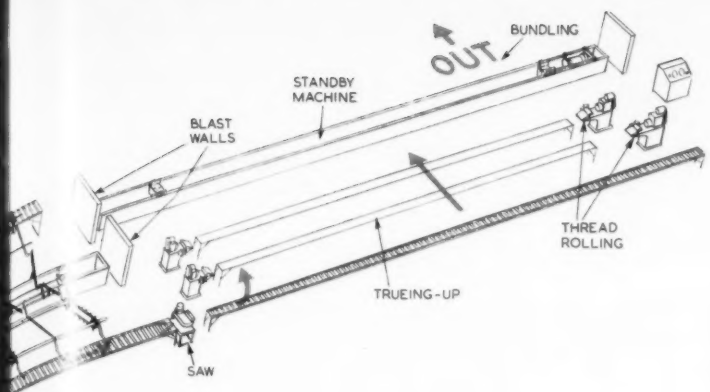
(*D*) Forward feed along the latter to stop.

(*E*) Transverse feed through (8) positioning rack; (9) stretcher; (10) delivery ramp; (11) transverse batching conveyor; (12) longitudinal transfer conveyor.

(*F*) Forward feed along latter to saw and then to stop.

(*G*) Transverse feed through (13) trueing; (14) thread rolling; (15) optional proof test machine; (16) bundling; (17) rail wagon.

The overall route is then a weaving one with alternating



transverse and forward stages, three of the latter and four of the former.

Material is lifted at either end of the flow-line by overhead Morris hoists travelling on a monorail which runs the length of the shop. Since the bar stock is so long, two hoists are brought into action together. All stages are capable of dealing with bars up to 60-65 ft long. A variety of methods are used for moving the material.

Furnace

Bars arriving on the feed table in batches are manually rolled one at a time into a set of rolls at the rear side just below deck level. From here they are pushed forward slightly until a set of driven pinch rolls propels them through the furnace, at the exit end of which is a second pair of pinch rolls for delivering them on to the cooling chamber rear rollers. The pinch roll pressure is pneumatically controlled and the drive to them is by chain from a variable speed 2-h.p. motor. Contained in the channel formed by the furnace brickwork are three driven rollers on which the bar stock rests, each roller shaft being water-cooled. There are four burners for the propane-oxygen jets consititing the heating medium for the furnace and these are cylindrical in shape and protected by water-cooled guides so that the bar under treatment may pass through the centre. In outward appearance the four burners stand between spans of brickwork, giving the impression that the furnace is divided into five small muffles; although in fact the bars are fed through continuously and reach a uniform temperature; the arrangement of the furnace is to assist ease of cleaning by removal of the top bricks without disturbing the rest of the equipment.

Cooling Chamber

When the bar is delivered into the back of the cooling chamber it is rolled in on idlers under the propulsive power of the pinch rolls at the entry end. The bar remains on these idlers until it is tipped off sideways on to a flat bed of transverse members by the action of pivoted levers brought into operation by a push button at the furnace control. The bed achieves slow cooling by the heat retention effect of hinged covers of asbestos sheeting and under panels of steel sheet. It is designed with transverse structural members which are alternately fixed and movable, the latter forming the top of a rectangular framework which is capable of the four actions in a rectangular course of the typical 'Walking beam' furnace, viz. (1) lift, (2) top rocked forward on pivots, (3) lower, (4) top rocked rearward on pivots. The top of this movable framework does then lift the bars in batches clear of the fixed framework, moves them forward one bar width and lowers them on to the fixed bed again, so permitting the entry of the next incoming bar, and ejecting the most advanced bar. Lift is achieved by two hydraulic jacks mounted under a heavy beam which runs the whole length of the 70-ft cooling chamber; flexibly mounted on the top of this beam are six rectangular cradles capable of pivoting about grease-lubricated pin-joints; the tops of these cradles represent the movable members of the cooling bed and to their underside are attached two parallel vertical slides between which rotate a pair of cams mounted on the rigid framework in such way that when the cams rotate the movable cradle top oscillates relative to the fixed structure. The rotation of the cams is achieved by a hydraulic ram on which is mounted a rack meshing with a pinion attached to a shaft running the whole length of the cooling bed so that it can turn the cams mounted on it at each cradle. The movements of the cooling chamber members are obtained by electro-hydraulic equipment. Electric control by means of limit switches achieves the automatic sequence of operations, while hydraulic power remotely controlled provides the action.

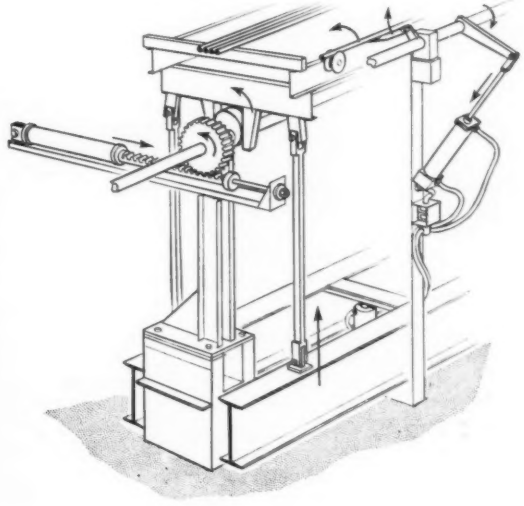
Batching Conveyor

On leaving the cooling chamber the bars roll down a racking ramp until retained by a stop. From this position they are lifted by the transverse batching conveyor. This is a chain and sprocket device with five parallel B.S.I. standard Renold chains to which are fitted vertical fingers or 'flights'; between these chains are guides to prevent the bars sagging. Drive is on the ratchet and pinion principle electro-hydraulically powered and transmitted to each chain sprocket by a common shaft which turns through 45 deg and deposits at each cycle one batch load, i.e. the content between two 'flights' on the chains, on to the longitudinal transfer conveyor. Provision has been made for an automatic counting device on the exit ramp from the cooling chamber to initiate the action automatically, which is at present achieved by push button on the stretcher control desk.

Transfer Conveyor

Each individual roller is fitted with a duplex sprocket wheel enabling it to be connected by two short chains to the roller on either side. The whole 200-ft long conveyor is divided midway approximately, each half being driven

Fig. 2. Cooler tilting mechanism



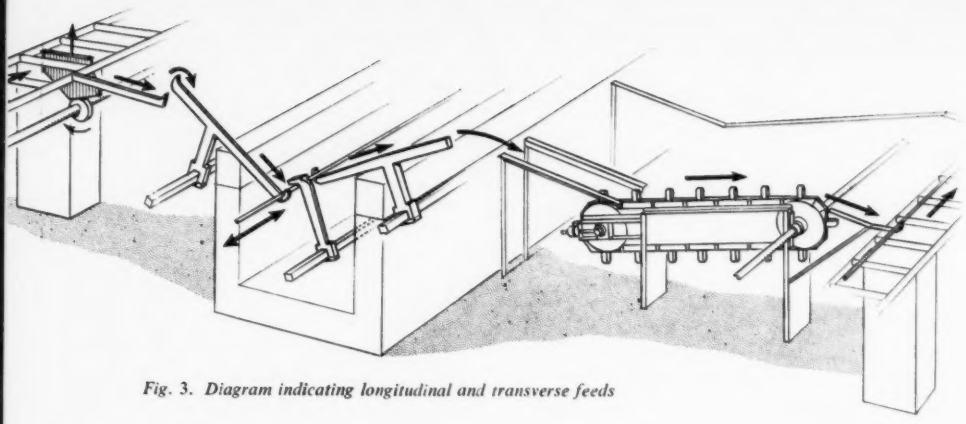


Fig. 3. Diagram indicating longitudinal and transverse feeds

by a 1-h.p. Crompton Parkinson motor which operates a conventional sprocket through a Richard Sizer worm reduction gear. The bars carried along this conveyor will normally have been rolled on to it in a heaped batch; to separate them a comb of vertical fingers has been laid across the conveyor and this does have the effect of disentangling any which are interleaved.

To lift the bars from the 'stop' end of the longitudinal conveyor on to a positioning rack at the side, the conveyor rollers are interspersed at 11 positions with pivoted wedges capable of being lifted from below roller level by the common bar on which they are mounted. This in turn is actuated through eccentrics mounted on a common shaft rotated by a pinion driven from a pneumatically powered rack push-button controlled from the desk. The lifting of these wedges naturally causes the bars to roll sideways on to the positioning rack.

Stretcher

The next step has called for considerable ingenuity, it being necessary to lift the bars from the positioning rack, place them in line with the stretcher carriages, hold them down so that in the event of a fracture broken pieces cannot fly, and lift them from the stretching position on to a further ramp so that they may be removed by a batching conveyor. This is achieved by three sets of arms, each set mounted on a common shaft turned by compressed air cylinders controlled from the desk. The arms may be considered to have the designations respectively of loading, locking and unloading. The loading arms pick up the bottom bar on the positioning rack with their rear hook and tilt so as to roll the bar to their other end which lowers the bar on to the rear hook of the unloading arms. The locking arms then move forward so as to enclose the bar stock on the other two hooks. In this position the work is stretched by a carriage hauled by the ram of a high-pressure hydraulic cylinder (6,000-7,000 lb/in^2), each end of the bar being held in suitable clamps. In an actual observed case the bar stretched 28½ in. After this the locking arms retracted leaving the bar on the unloading arms which were then tilted so that the bar ran down on to a ramp, when the loading arms returned to the starting position.

Sawing, Threading, Finishing

From the ramp a batching conveyor identical with that at the exit side of the cooling chamber remains stationary until batches, which may be as much as one shift's work, are mounted on it. Successive batches are then delivered to a holding ramp from which the saw operator is then able to select and deliver the batch bar-by-bar towards the saw on the powered roller conveyor, similar to the previous longitudinal transfer conveyor already described. The saw cuts the bars to length before they travel the remainder of the conveyor to a stop from which they are manually rolled transversely on skids through the succeeding operations. The most important of these is thread rolling on Joshua Heap screwing machines fitted with rotating thread rolling heads by Fette. This is a fundamental improvement in the process since it means the locating nut in the concrete assembly does not have to be so accurately located. On the other hand the thread rolling takes place to very fine limits. In this connection it is significant that the skids are at working height and drop the bars on to rollers in exact line with the work heads of the thread rollers, materially assisting accuracy of workmanship.

One result has been that although the proof stress testing machine stands next available in the line of operations, 10,000 bars now produced on this circuit have been passed without a single failure. There is, therefore, a likelihood that this additional testing will become selective or at customer's request. The plant has fully proved itself on this evidence alone.

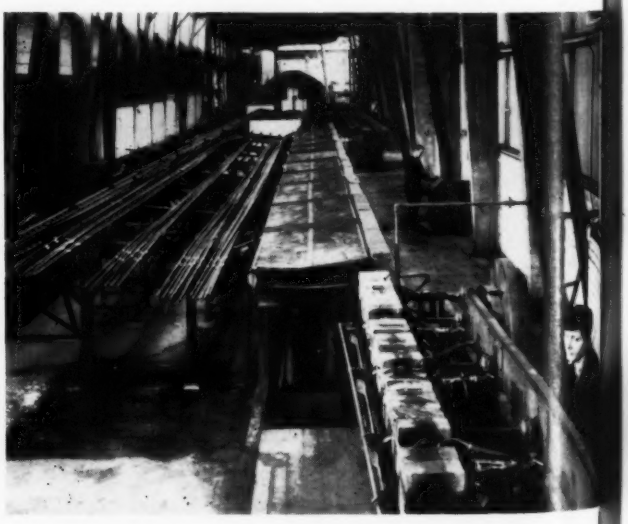
Controls

At present control is effected by push button and lever from the following stations: (1) the furnace; (2) the stretcher control desk; (3) individual equipment at the finishing end. Designs are, however, already prepared enabling the cycle throughout to be automatic except on the actual stretching.

Acknowledgment

We would like to acknowledge with thanks the permission of the directors of McCalls Macalloy, Ltd., and Techno Handling, Ltd., of Leeds, to secure and publish this data.

Fig. 4. View of plant from input end showing furnace in foreground leading into cooling chamber and transverse conveyors. The stretching machine is in centre background with the threading bay beyond



MECHANICAL LIFTING OF ALUMINIUM SLABS

ABOVE
Fig. 1. The slab passes through the Rhodes guillotine

RIGHT
Fig. 2. Showing load-carrying legs of the King 'Mansaver'

THE HANDLING of larger and heavier aluminium slabs is now made possible at the Banbury Works of Northern Aluminium Co., Ltd., by the installation of two mechanical lifting devices made by Geo. W. King, Ltd., Stevenage, Herts., which will handle slabs of up to 85 ft long single and in batches.

The production and consumption of aluminium today has reached a new high level. With its uses and processes considerably developed by the demands of war, aluminium has become a familiar metal in aircraft construction, architecture, food processing, chemical equipment, domestic appliances and in countless other fields. The steadily increasing demand coupled with research to establish even wider applications makes it necessary for the industry to continue to follow a policy of expansion, and to seek methods to improve output.

The mechanical lifting equipment designed and installed at Banbury by Geo. W. King, Ltd., who worked in close collaboration with the engineering staff of Northern Aluminium Co., Ltd., represents part of an expansion and re-equipment plan recently completed in their rolling mills, where one of the processes scheduled for improvement was the transfer of slabs from the primary mill to the intermediate mill or annealing furnace.

The production of aluminium strip at Banbury begins with the re-melting and alloying of the virgin metal. Commercial aluminium, of 90-99·5 per cent purity, is delivered to the fabrication plant in the form of 'pigs' or 'notch-bars'; in the remelting process other materials are added to adjust the composition to that of the alloy required.

Ingots for rolling are cast by the semi-continuous process, in which the metal is poured into a water-cooled mould with a withdrawable base mounted on a hydraulic ram. The sides of the mould are only a few inches deep and are cooled with an abundance of water. In the very short time, therefore, that it takes to fill the mould, the metal at the bottom solidifies and contracts away from the sides of the mould. The hydraulic ram supporting the bottom plate is then slowly lowered as the solidified metal comes through and pouring proceeds continuously until the required length of the ingot is reached. Rough edges and sides formed during casting are required to be removed or 'scalped' before rolling, and this is carried out by large milling machines.

Pre-heating, the necessary preparation to the primary hot rolling process, is carried out in furnaces adjacent to the start of the hot rolling line, from where the ingots are extracted singly by heavy-duty mechanical tongs and placed on a receiving table. Under the control of an operator the

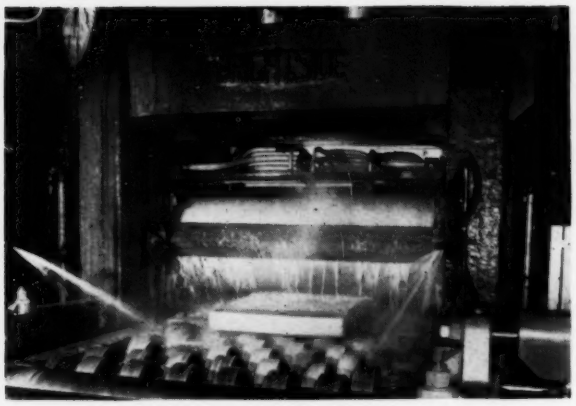


Fig. 3. 'Breaking down' the ingot in the first rolling mill

hot ingot, weighing up to 4,000 lb, is carried on the live roller table to a Brightside 84-in hot rolling mill for 'breaking down'. Before entering the rolls, the ingot is straightened and centralized by hydraulic rams. Both mill rolls and tables are reversible and the ingot passes backwards and forwards until its thickness has been reduced from 9 in to less than $\frac{1}{2}$ in.

The slab, which may be as long as 85 ft at this stage, is now passed through a Rhodes guillotine where ragged ends are cut, and on to a Loewy edge trimmer where rough and uneven edges are removed. Finally it comes to rest on a slab-piling conveyor unit where all the slabs coming through the mill are allowed to cool. At this point the King *Mansaver* grab lifts the whole pile of up to 40 slabs and takes them to the loading bay for the next rolling process, either directly or via the annealing furnace where work hardening is removed and ductility restored.

The King *Mansaver* is an electrically operated grab of $10\frac{1}{2}$ tons capacity, having 13 pairs of load-carrying legs spaced at 6-ft centres and supported by two double-channel load-bearing beams running the full length of the grab. The load beams are attached to the outer end of seven pairs of opposed rack beams running between cast-iron flanged rollers; these are motor-driven for opening and closing to suit the width of the load through totally enclosed worm gear units and chain incorporating a slipping clutch to give motor overload protection. The whole grabbing unit is integral with a 72-ft box-lattice girder arranged for two-point suspension from an overhead travelling crane whose operator controls all grabbing and travelling operations. Both the grab and lattice girder structures are constructed of 95 per cent aluminium alloy sections.

For the next operation it is necessary for each slab to be lifted separately from the batch and placed in position for intermediate rolling, and for this purpose Geo. W. King, Ltd., have designed and installed an overhead de-piling crane which, by the use of rubber suction discs, lifts a single aluminium slab swiftly and safely from the top of the pile. The King de-piling crane comprises a lifting beam, which also acts as a suction manifold, to which 44 suction discs are attached by load-bearing chains and connected by flexible air hose. A vacuum pump creates the necessary suction when the discs make contact with the aluminium

Fig. 4. The King 'Mansaver' grab carrying aluminium slabs for the next process

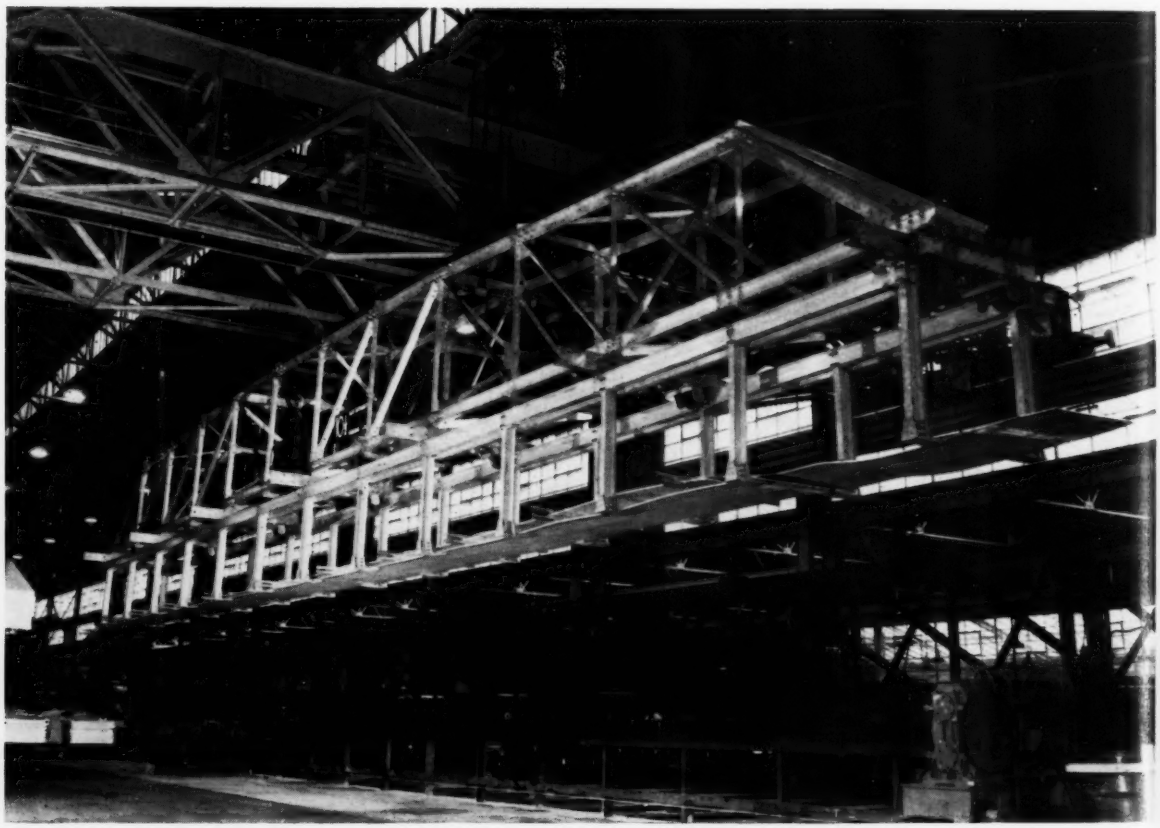


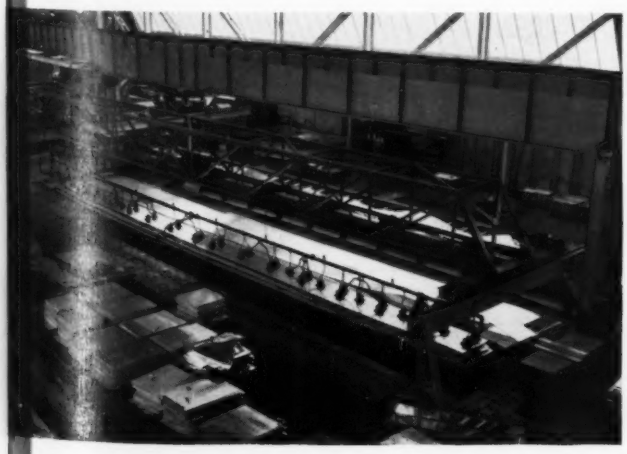
Fig. 5. The King overhead de-piling crane ready to lift a single slab

slab, and the whole beam is hoisted by 10 wire ropes attached to separate drums mounted on a common shaft located within the box-lattice framework of an 87-ft span electric overhead travelling crane.

All or just isolated groups of suction discs may be used according to the length of slab being handled. Each disc is also fitted with an automatic cut-out to prevent loss of vacuum should an irregular size of slab cause failure to contact. All crane and vacuum motions are controlled from a desk at floor level where the operator has a full view of the area served by the crane.

Fig. 6. Showing the suction discs in contact with an aluminium slab

Fig. 7. General view of the King de-piling crane about to lift a slab from pile



When the slab is located on the roller table the vacuum is released and the crane made ready for the next slab. The employment of this method ensures that the largest of slabs within the maximum span of the crane can be handled eliminating all possibility of damage to surface or edge.

Intermediate rolling, carried out by a Robertson four-high cold roughing mill, reduces the thickness of the slab still further, after which it is coiled and conveyed to other sections of the works for further rolling, tempering, shearing and slitting and other processing according to the various industrial, commercial or domestic uses for which it is finally intended.

FLOUR IN BULK

THE DIMINISHING NUMBER of smaller bakeries and the consequent decreasing demand for flour in the traditional sacks has meant that more millers are adopting bulk storage methods for their flour and the bulk transport of it by road and rail vehicles.

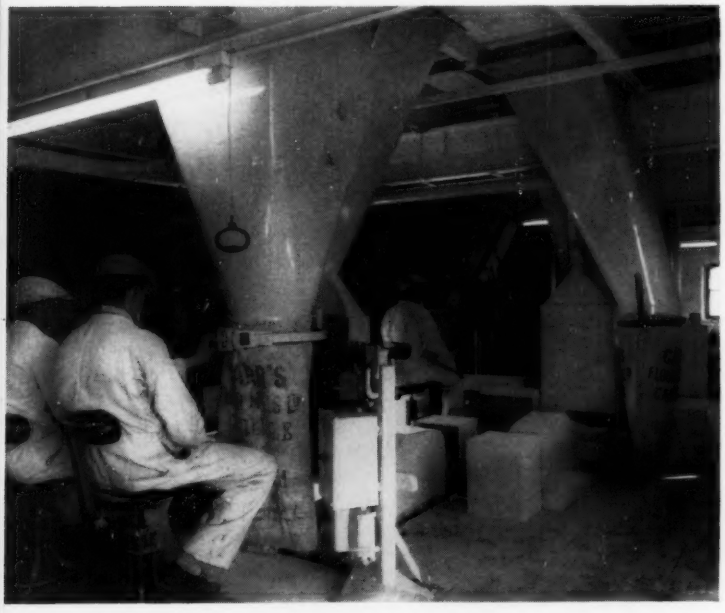
The bulk storage system has many advantages. It saves valuable space, permits automatic control of operation and avoids unnecessary handling of the flour. It is a trend which is gradually increasing in emphasis and, indeed, the mechanical handling engineers are keeping in pace with it by steadily improving their conveying systems and the designs of bins and bin dischargers.

One of the latest converts to bulk storage methods is Carr's Flour Mills, Ltd., Silloth, Cumberland, who recently completed the installation of an automatic elevating, conveying, storage and discharge plant at their Solway Mills warehouse. The plant has main storage bins of 300 ton flour capacity and outloading bins of 15 ton capacity.

The adoption of the system means that though milled flour will pass into the Solway warehouse on a continuous 24-hour production programme, the flour will be automatically stored in bulk and then discharged or 'sacked' as required during the normal 8-hour day shift.

Fig. 1. The control panel on the fourth floor of the Solway Mills warehouse. This is the master panel which controls all the equipment on this and upper floors, the conveyors, elevators, sieves, entoleters, weigher-packers and pre-bin weighers

Fig. 2. 'Sacking-off'. Though the main object of the whole conveying system is to step up the bulk discharge of flour into road or rail containers, a certain amount of flour is run into sacks as shown. Here are the high-speed weigher-packers, possers, sack-sewers, and sack conveyors



The new equipment has been planned in co-operation with Carr's by Conveyors (Ready Built), Ltd., Stroud, Gloucestershire, mechanical handling engineers who have specialized for many years in the 'en masse' bulk conveying and storage of powdered, granular, flaky and similar type materials. The installation of the equipment was carried out by Carr's own engineering staff, and throughout the period of its erection the full quota of flour production was maintained.

In addition to the series of main bins and bulk outloading bins the system includes pre-bin weighing and sifting equipment, after-bin blending, sifting and sacking-off on high-speed weigher-packers, together with the normal conveyor lines of the Ready Built 'en masse' system. The sequence of operation of all the machines is dealt with by electric control panels.

System at Work

The various grades of flour are drawn from the adjacent mill to the fourth floor of the storage warehouse in four separate streams by worm conveyors. The flour is first thoroughly sieved by automatic screen sifters and is then 'flowed' by twin Ready Built conveyor lines to the pre-storage weighers.

After weighing, the flour is passed through entoleters and is then elevated and conveyed in two lines to the main storage bins. These consist of a battery of 12 vertical-sided bins, each being 40 ft high with floor dimensions of 8×5 ft. Each individual bin holds 25 tons of flour, giving an overall flour capacity of 300 tons. The storage bins are arranged in three sets of four bins each. Each bin is of all-steel construction with specially treated inside surfaces.

Moore vibratory dischargers are situated directly under the bins to give an even discharge of flour over the whole

Fig. 3. Conveyor lines like these carry the milled flour from point to point in the storage warehouse at Solway Mills. These are the over-bin conveyors—typical of the conveying system used throughout the plant

Fig. 4. (Right) Under-bin hoppers and discharge conveyors, showing the controls of the Moore bin dischargers and also elevators

area. These dischargers are reliable in operation and their power requirements are exceptionally low. A feature of this discharger is that the vertical bin walls are utilized, allowing much greater flour capacity in a given space than other dischargers normally used for non-free-flowing material.

'Tidal' control units in the small collecting hoppers under the dischargers regulate the flour into Ready Built discharger conveyors fitted with variable-speed drives. There are three lines of bins and conveyors, and it is possible to draw off two grades of flour at any one time by Ready Built *Eleveyors* and *Zedeveyors* which feed redressers arranged in the roof of the building.

Further conveyors feed two high-speed weigher-packers, each being easily capable of dealing with 240 sacks of flour per hour.

In effect, these packers, in conjunction with the main storage bins, allow for the 24-hour production of the mill to be dealt with in a normal 8-hour day shift. Thus, night packing, which had been necessary to date, is eliminated.

The sacks, on leaving the packers, are 'possed', sewn and automatically despatched by sack conveyors, elevator and a series of further conveyors to the sack storage warehouse. The two sack conveyors under the sewing machines are equipped with a photo-electric system of control for the passage of sacks to the main central conveyor.

When despatching bulk flour to road tankers or bulk railwagons there is an alternative run from one of the weighers direct by elevator to three bulk outloading bins. These bins are fitted with dust-tight control slides allowing road or rail vehicles to be filled at high speed.

Each of the three bins has a capacity of roughly 5 tons of flour and, as in the case of the main storage bins, the construction is of steel.

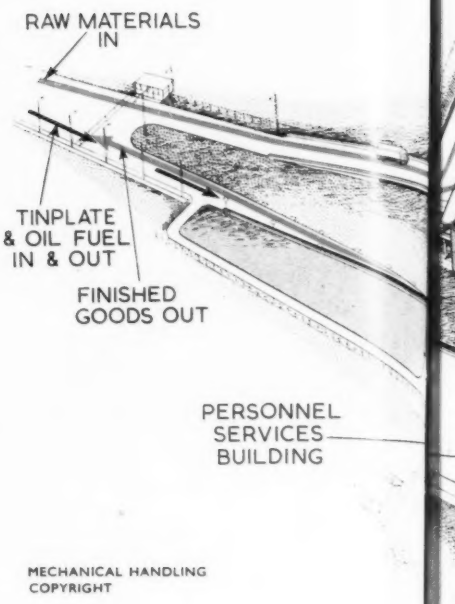
This Ready Built installation is claimed to be easy to maintain and service, noiseless in operation, minimizes production cost and causes no damage to the flour handled. The whole system can be regulated from two master control panels, one on the fourth floor of the warehouse and one on the ground floor. These panels indicate the state of the lines, elevators, bins and so on at any moment, and the system can be easily regulated from these master controls.

By the full use of these automatic bulk storage and discharge methods Carr's Flour Mills, Ltd., are geared to cope with any sort of requirements, from bulk deliveries of flour to the bigger bakeries to the small-quantity 'sacked' flour demands of the smaller man.

CONVEYORS IN A NEW FOOD FACTORY

Conveyors run all the way in the Commonwealth's biggest Food Factory

BY A SPECIAL CONTRIBUTOR



Impression by our artist of the new Heinz factory at Kitt Green as seen from the air. As indicated by the coloured arrows, the raw materials of food production are brought up an elevated approach road to the first-floor store and are processed in continuous sequence on the upper floor of the production building. Cans manufactured in a separate building are brought to the main building through a covered gantry. Cans and processed foods are brought through the mezzanine service floor and meet at the filling stations on the first stage of their return journey through packaging to the ground-floor warehouse

CONTINUOUS forward movement of materials throughout the production processes and 100 per cent palletization in the stores and warehouse are achieved by Heinz in their Kitt Green Factory.

Visitors to Kitt Green are driven round a building of brick and glass. Two million massed bricks enclose the storage area while manufacturing proceeds behind a curtain-wall of glass over 1,000 ft long and 50 ft high. Through the glass walls they see the dancing cans that reflect the rhythm and tempo of the production lines.

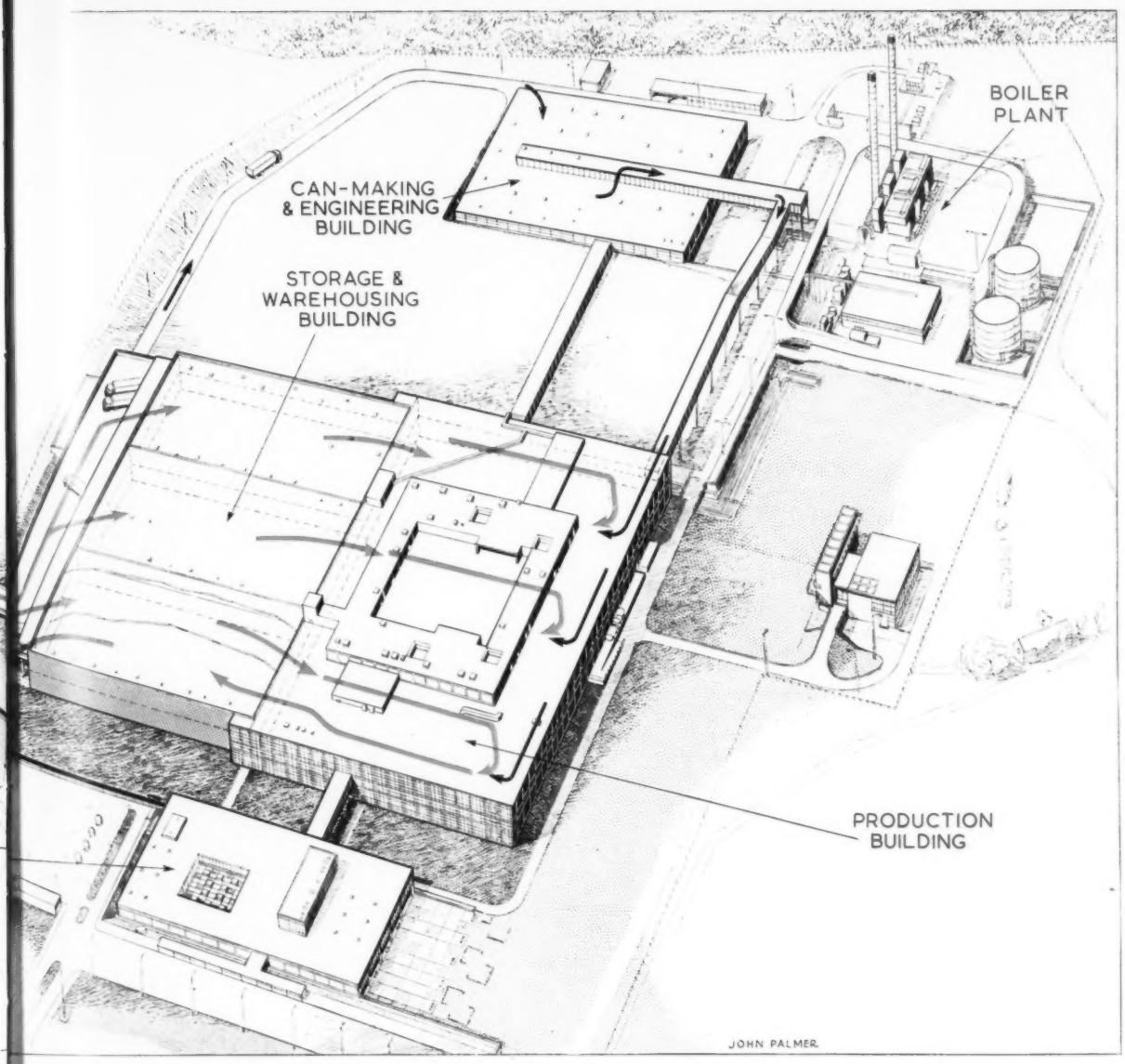
From the separate building in which they are made and inspected the cans flow in a continuous stream along a covered gantry and into the main building where they are washed, inspected, filled, sealed, sterilized, labelled, packaged, and warehoused for despatch. Flowing to meet them from the processing sections are foods famous among the 57 Varieties: Baked Beans, Soups, and Baby Foods. From the points at which the raw materials are fed to the production lines to those at which the packages are discharged, the materials are carried forward automatically by conveyors operating in synchronism. During certain processes, between these forward movements, ingredients are pumped through pipelines and allowed to fall by gravity. From its initial stages the project was planned around the conception of a continuous and integral forward flow.

Exploiting a Sloping Site

On a sloping hillside above Wigan, the factory stands on a site of 150 acres, which was chosen for reasons that included proximity to the existing Heinz factory at Standish and the availability of a good water supply, but was far from ideal from the architect's point of view. In the result, however, the 1-in-40 gradient has been turned to functional and aesthetic advantage; the building is in sympathy with its environment, commands a splendid view of the high moorland of East Lancashire, and enables materials to be routed in a convenient and economical manner, with first-floor intake of raw materials and ground-level despatch of finished goods.

Our artist's drawing illustrates this feature, and shows also the three-level block built on the lower end of the slope, in which the upper and lower production floor are divided at mezzanine level by a space reserved for services and the circulation of personnel. Vehicles delivering raw materials travel up an electrically heated (only in snowy weather) concrete ramp to the first-floor storage area, from where the various ingredients are fed to the conveyors serving the preparation lines and the ovens and kettles in which they are cooked. At ground-floor level the cans are washed, inspected, filled, sealed, sterilized, labelled, packaged, and stored and vehicles taking delivery goods for despatch reach the warehouse by a separate service road.

To allow for future expansion of the production area, the building in which the cans are manufactured is separated from the main block, and the cans are brought to the production building by conveyors carried in an enclosed gantry. Also separated from the production building, and connected with it and the can-making section by covered bridges, is the administration block. People arriving at the factory enter this building at road-level and walk up an inclined bridge that leads to the mezzanine floor of the production block and



provides direct access by staircase to each of the production departments. Thus lifts and elevators have been eliminated, and people and materials move along direct and economical routes.

The simplicity and elegance that enchant the visitor as he approaches the Kitt Green factory are an outward indication of the efficiency that characterizes the whole project.

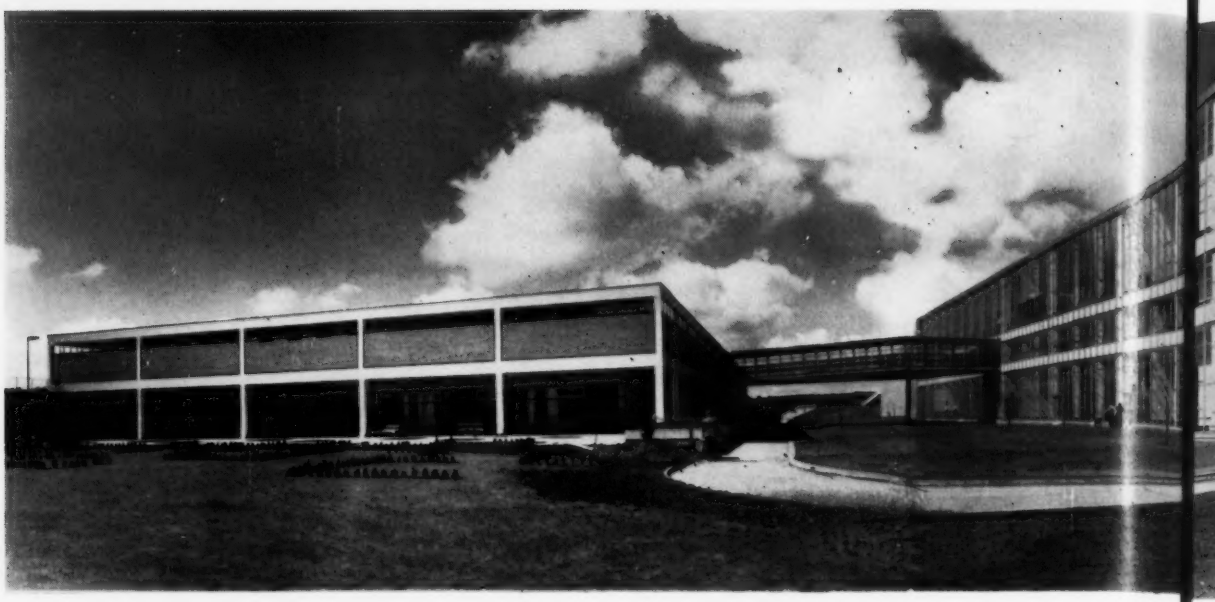
Six Million Beans an Hour

Oven-baked beans were number one priority in the phasing of the Kitt Green building programme. The processes through which they pass exemplify the Heinz perfectionism that to the layman seems fantastic. Each bean is air cleaned, graded for size, sorted for colour, whirled through 12 lots of rushing water, screened, cascaded, blanched, screened, passed through metal detectors, baked, visually inspected and subjected to laboratory sample tests. The beans are then blended with tomato sauce, are packed in washed cans, and the filled cans are sterilized after the closing and sealing operations and before being labelled and packed.

These operations fall into three main groups when considered from the handling aspect—which is, in effect, inseparable from the production function in this section as elsewhere in the Kitt Green factory. In the first phase the beans are handled in the dry state; in the second, during the washing and blanching, they are water-borne; in the third, after blanching and baking and during the blending and filling operations, they are cooked and tender and must be handled with extreme delicacy; finally, the canned beans are handled as unit loads for the sterilizing operation before being passed to the packaging lines.

Heinz oven-baked beans, made according to an ancient home-made recipe with tomato sauce and pork, were first produced in England in the 1930's, in the Harlesden factory. Sales soared, and the existing capacity at Harlesden, huge though it was, became inadequate.

Like haricot beans, but smaller, known in farmers' language as 'navy beans', they are imported from Michigan, Chile, and Hungary, Michigan being the principal source. The Michigan and Hungarian varieties are delivered in 100-lb bags, and the Chileans in 176-lb bags. The bags are palletized at the docks and brought to the processing line on pallets



(storage and warehousing arrangements will be dealt with later under their own heading). As required, they are loaded on to sack-tippers by which the beans are raised and discharged into a hopper and enter an aspirated system of enclosed *en masse* conveyors by which they are carried through the preparatory processes. Two sack-tippers are installed, each capable of holding two of the 100-lb bags or one of the larger bags. Working together, the tippers can charge the hopper at the rate of 8,000 lb of beans an hour, and thus enable the dry cleaners to be fed at their maximum working capacity.

From the hopper the beans are discharged through a grid, which catches large foreign matter, and passed to an elevating conveyor by a magnetic feeder for the removal of metallic inclusions. Husks and string are removed by the revolving screens of the scalperator and a large proportion of the light-weight impurities are extracted by aspiration.

After undergoing this preliminary cleaning treatment the beans are elevated by a second *en masse* conveyor to a five-screen Boby sifter for the removal of splits and oversized and immature beans. The sized beans are then raised by a third *en masse* conveyor to air cleaners, for yet another cleaning operation, before being passed through electronic colour-sorters, continuously weighed and transferred to storage silos pending further treatment.

At this point the plant operates continuously throughout the 24 hours and on every day of the week to enable the costly electronic machines to be used to full capacity. Developed with the co-operation of the Heinz company for use at Harlesden, these machines operate with remarkable speed and accuracy, quality of discrimination being achieved by an optical device that illuminates the entire surface of the bean and enables the smallest sign of discoloration to be detected. The equipment installed at Kitt Green is a small version of the Harlesden installation. It comprises 84 machines in six cabinets, each of which forms a 14-unit bank. Each bank is provided with a built-in distribution hopper of 1,640 lb capacity for the unsorted stock, vacuum ducting for dust extraction, and gathering conveyors for the accepted and rejected beans. Each machine is an assembly of three self-contained sub-assemblies; a feeder, a discriminator, and a power pack, any of which can be withdrawn for maintenance and replaced by a spare without disturbing the others or interfering with production.

Each sorting machine is capable of handling 30 lb of beans an hour. When the beans in process are Michigans, which average 2,400 to the pound, no less than 72,000 beans an hour are being discharged continuously from the hopper into each unit, marshalled into single file, and passed through the centre of the inspection head. Accepted beans gathered from the sorting machines by *en masse* conveyors are weighed and recorded in terms of 112-lb batches, by an automatic continuous bulk weighing machine linked with a counter, before being elevated into silos for temporary storage.

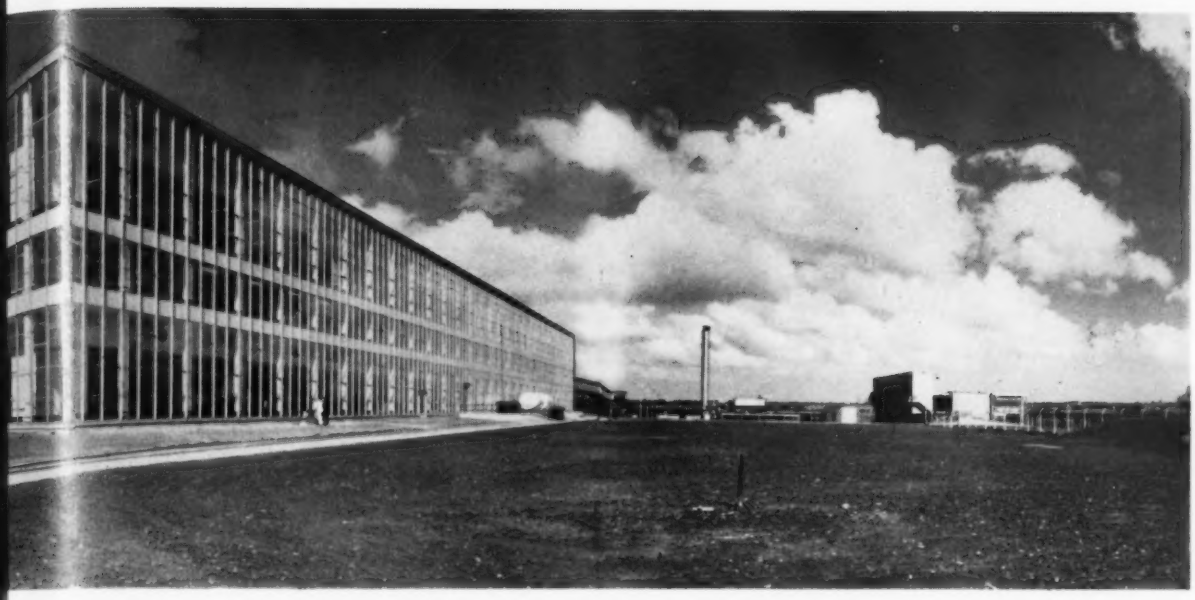
Each silo has a capacity of 20 tons. Six units have been installed to accommodate an intake, from an augmented battery of sorters, of more than 8,000 lb/hr. Provision has been made, furthermore, to enable this rate to be raised to 16,000 lb/hr by adding two more silos and increasing the capacity of the preparation plant.

Intake to the electronic sorting machines is controlled at the points of discharge to the distributing conveyors, from which signals are relayed back to the preceding conveyor systems. Overriding control over the whole of the dry-bean preparation plant is exercised by electronic level-controllers in the 20-ton silos. The flow of beans throughout the system and the actuation of signals at control and relay points are traced on a mimic diagram on the main control panel near the sack tippers.

Wet Bean Preparation, Blanching, Baking and Filling

Though cleaned and graded for size and colour, the beans are required to go through 12 washing operations, followed by screening and cascading, blanching, screening, baking and inspection before they are ready for blending with sauce and filling into cans. From a handling point of view, these further cleaning processes form part of the manufacturing sequence that is initiated by a feeder controlling the discharge from the storage silos and ends when the baked beans are discharged into the hopper on the mezzanine floor.

On leaving the silos the beans are scanned by a magnetic separator and passed over a continuous belt weigher before being elevated vertically to the feeder that regulates their rate of feed to the manufacturing system. This may be up to a maximum of 8,000 lb/hr from the six silos now installed, or 16,000 lb/hr when the storage capacity is increased. From a point just below ceiling level, the beans enter a hydro system for the removal of stones, splits, and skin. In this section they are borne by water through a series of 12 cones at such

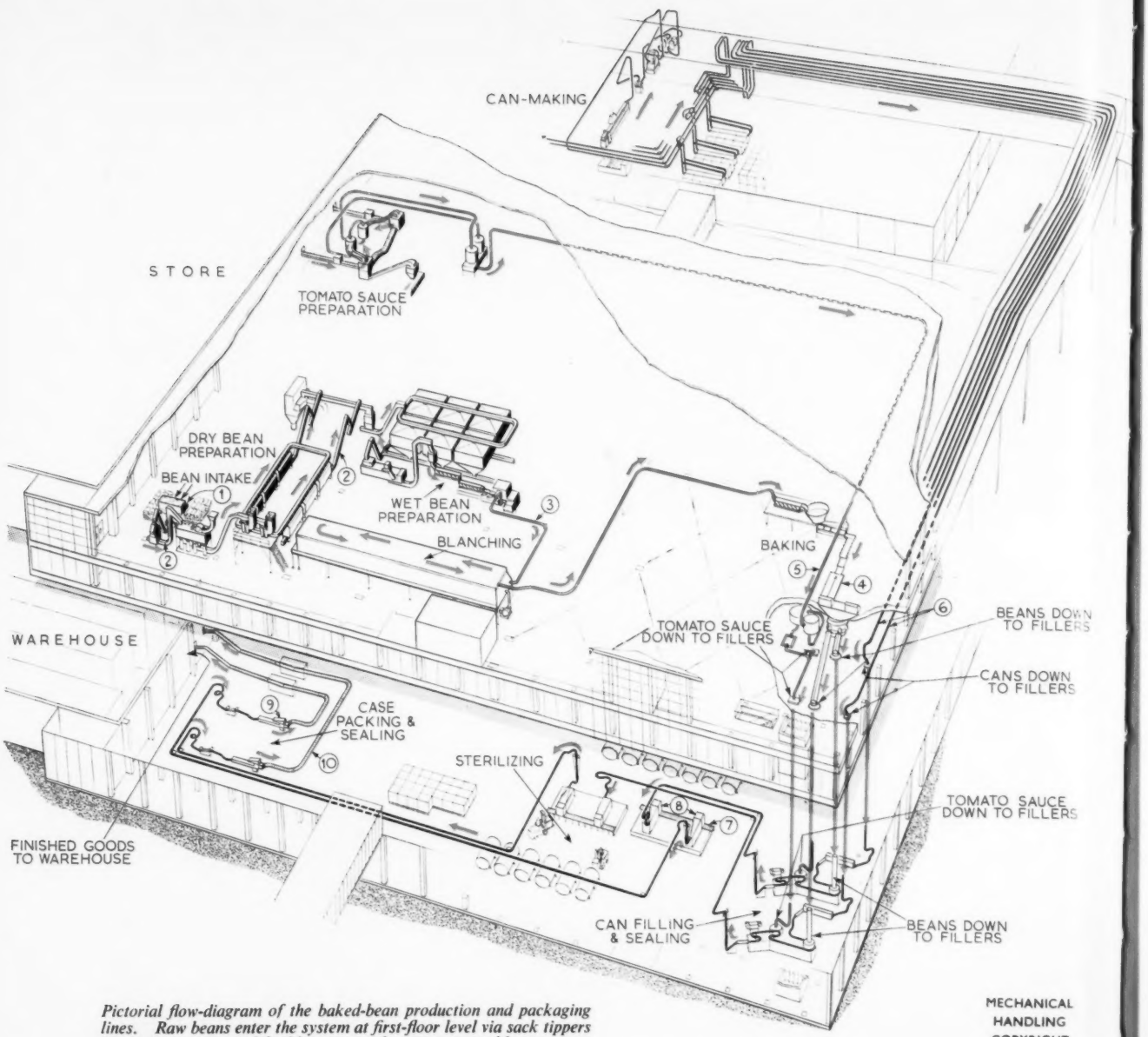


ABOVE
The main manufacturing building surrounded by the longest glass curtain wall in England (1,080 *ft long*) *showing on the left the Employee Services Building and Canteen connected with the main building by a covered personnel bridge and on the right the boiler installation water purification plant*

BELOW
Cans are conveyed from the can-making building to the main manufacturing building (*left*) *by an overhead gantry containing eight can runs. On the right is the open boiler installation*

a velocity that the beans are whirled through orifices in the upper parts of the cones while the heavy inclusions shaken from them settle in the quiet water at the base.

This operation is followed by partial dewatering, as the beans pass over a series of wire screens with adjustable baffle-plates, and the removal of splits and skins by cascade separation. When the beans leave the screens and flow on to



Pictorial flow-diagram of the baked-bean production and packaging lines. Raw beans enter the system at first-floor level via sack tippers (1) *feeding intake and feed hoppers, and are transported by* en masse *conveyors* (2) *to and from cleaning and grading plant and storage silos and on to the wet-bean preparation section. Beans are pumped through the blanching pipeline* (3) *after which the beans are de-watered and carried by vibratory conveyors* (4) *under the baking ovens and past inspection stations, and discharged into a service hopper for filling.*

Tomato-pulp mixture, pumped along pipelines (5) *and cans brought in by conveyor* (6) *from the separate building in which they are made, are brought down through the mezzanine floor at the filling stations. Filled cans, sealed and washed, are discharged on to platforms from which they are filled into baskets standing on rollers* (7) *for transfer to sterilizing retorts before passing on to the packaging section, the baskets being filled and emptied with the aid of loading and unloading machines* (8) *and transferred to and from the retorts by fork lift trucks. After cooling and labelling, the tins are packed into cases by automatic case-packers* (9), *the cases then travelling on roller conveyors* (10) *through sealing machines and on to the warehouse*

and over a series of steps, the water ratio and velocity are so adjusted that the whole beans cascade over the steps while the splits, skins and other light particles are carried away by the water that falls between them.

Having been cleaned, cleaned and cleaned again, the beans are at last deemed ready and fit for blanching, an operation performed by fluming them through pipework with specially treated temperature-controlled water. At the end of the operation the beans are again screened, the blanching water is cleaned and recirculated. Temperature and rate of flow are critical for this operation and are controlled from a central panel.

From the blanching operation the beans are transferred to a vibrating conveyor that carries them through the ovens. Baking is followed by a metal-detection unit and visual inspection after which the beans fall by gravity to a hopper on the mezzanine floor and are fed under the control of an electronic level control to the filling lines. Meanwhile, tomato sauce is being pumped to the filling hopper through a flow-control valve, and the blended mixture is filled into the cans—cans, filler and contents being synchronized with perfect exactness as they come together. It is interesting to note that from the blancher, when the beans are tender and

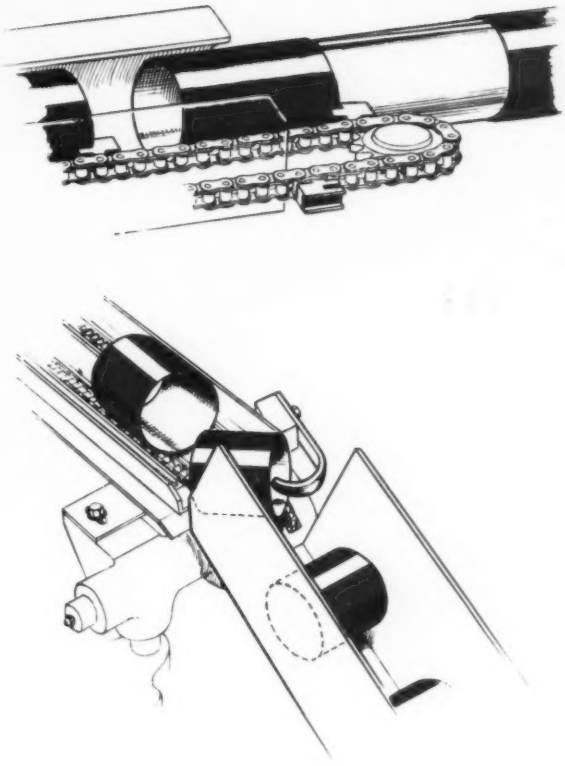
easily broken, a vibrating conveyor is the chosen handling medium.

Apart from the thoroughness of the preparatory treatment, the repetition of cleaning operations that seems to the layman to mark a fanatical regard for purity and uniformity, the two features of this section of the plant that make the strongest and most enduring impression are the completeness of the automation and the clarity of the atmosphere. One expects an almost surgical cleanliness in a modern food factory, and the full enclosure of conveying and processing equipment, and an adequate system of dust extraction. But it is rarely indeed that the visitor to a processing plant can find no evidence in the atmosphere that a scalperator is at work, and special credit is due to the efficiency of the aspiration units in the bean-preparation system at Kitt Green.

Retorts Loaded by Fork Lift Trucks

When the cans have been filled, capped, and washed by automatic machines, the continuity of movement is interrupted for a sterilizing operation. Filling proceeds continuously, day and night. The filled cans are brought by cable conveyors to a marshalling station where they are loaded into baskets designed to fit the horizontal retorts. Loading has been made so easy by the installation of a Busse loader that there is nothing to it. The cans, brought to the loading platform by cable conveyor, are assembled into batches sufficient to cover one shelf of the basket and transferred with a pusher plate as the unloader brings each shelf in turn to the level of the platform. When the basket is full it is transferred to marshalling rollers from which it is picked up by a fork lift truck that leads it directly into the retort.

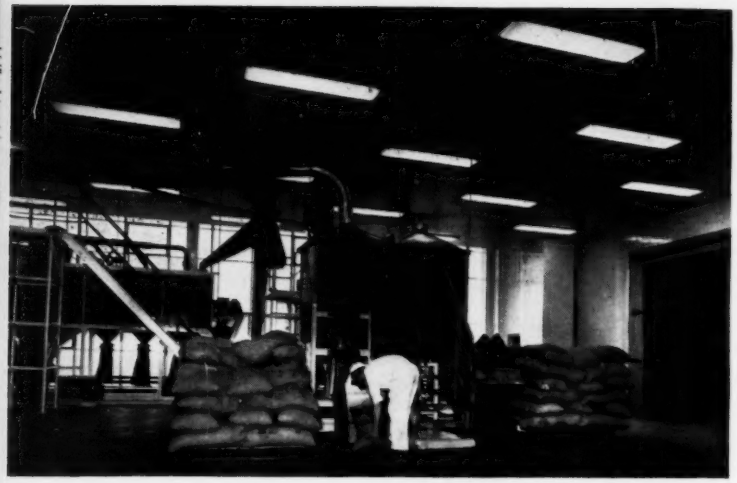
Sterilization completes the bean-processing operations and the cans, removed from the retorts and baskets by a reversal of the loading procedure, and unloaded automatically by a Busse unloader at the rate of over 300 cans a minute, move on to the packaging line. They travel on steel cable conveyors to automatic high-speed labelling machines capable of handling 500 cans a minute, after which the labelled cans are assembled and packed into fibreboard cartons by a non-shock case-packer at the rate of up to 600 cans/min. The cartons are of uniform size and hold two dozen 16-oz cans or four dozen 8-oz cans. They are carried by two lines of



Two examples of the manipulative devices employed on conveyor lines in the continuous can-making plant at Kitt Green

BELOW

Can Labelling, Packing and Case Sealing area



Intake end of the dry bean preparation plant installed by Henry Simon, Ltd

belt conveyors with powered roller curves to two gluing and sealing units, each operating at 31 cases a minute and thence over counter and into the finished-goods store.

Movement through these lines is continuous and automatic from the stage at which the sterilized cans are loaded on to the conveyor. Packaging materials are brought down by chutes from the floor above and discharged at points adjacent to the machines by which they are used. On reaching the ground floor they are ready for use without any preparatory work; the cartons, for instance, are folded at the bottom, with their open tops erected ready for presenting to the case-packing machine.

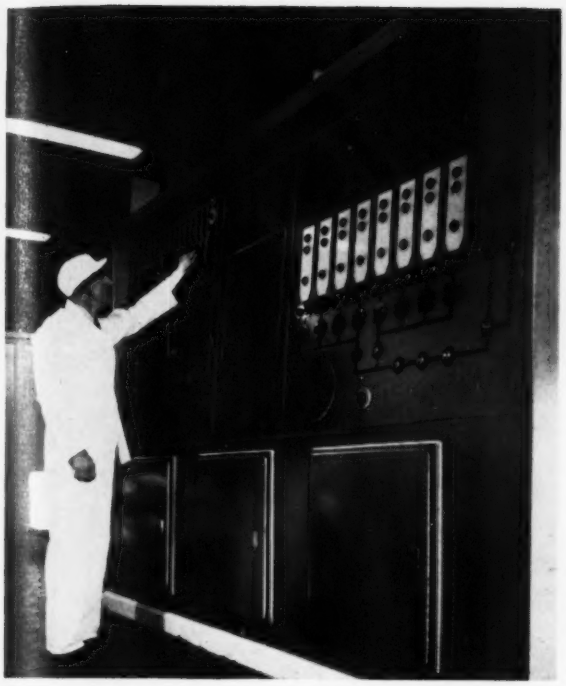
Continuous Handling of Fresh Vegetables Through Preparation Plant

Enormous quantities of fresh vegetables, chickens and meat are consumed at Kitt Green in the preparation of canned soups and baby foods. In the meat room the intake of raw chicken is at the rate of $8\frac{1}{2}$ tons for each shift, in addition to the frozen meat and oxtails. In the vegetable preparation section the quantities are five times as great, and the handling is continuous and automatic. During each shift, prepared vegetables are produced, having been transported to and from shakers and washers, peelers, trimmers, and dicers, by an elaborate yet flexible system of conveyors.

Carrots and potatoes are the preponderant vegetables. The operations performed on the two kinds of vegetables are almost, but not quite, identical and, by providing by-pass sections where the divergences occur, the conveyors have been made interchangeable, so that either line can be used for carrots or potatoes.

The vegetables are stored in sacks which at present are discharged manually by pulling the sack along gravity rollers and tipping the contents over a chute, but experiments are being made to test an alternative method employing a box pallet with a trap-door. To meet the regulations, the storage and production areas are divided by fireproof doors, and the chutes have been made removable to enable the doors to be closed. From the chutes, the vegetables are discharged on to Pegson shakers by which soil and other foreign matter and undersized vegetables are removed, after which they are

I.T.D. 'Stacatrucs' at work in first-floor raw-materials store



Control panel for the dry-bean preparation plant installed by Henry Simon, Ltd.

One of the 'Celectric' colour-sorting machines withdrawn from cabinet

transported by inclined screw conveyors to buffer storage hoppers. From the silos they are fed at a controlled rate to continuous washing machines in which the vegetables are propelled forward and cleaned by a series of paddles.

Up to this stage the two lines follow parallel routes appropriate to either potatoes or carrots, but on leaving the washers alternative courses are available. In the first line, the material is carried by screw conveyors to a main distributing screw from which it is fed through any of seven valves to a battery of continuously operating abrasive peelers. Peeled vegetables are discharged on to another long screw conveyor and raised to a horizontal conveyor, with a 5-ft wide belt of odourless and tasteless materials, that serves the trimming section.

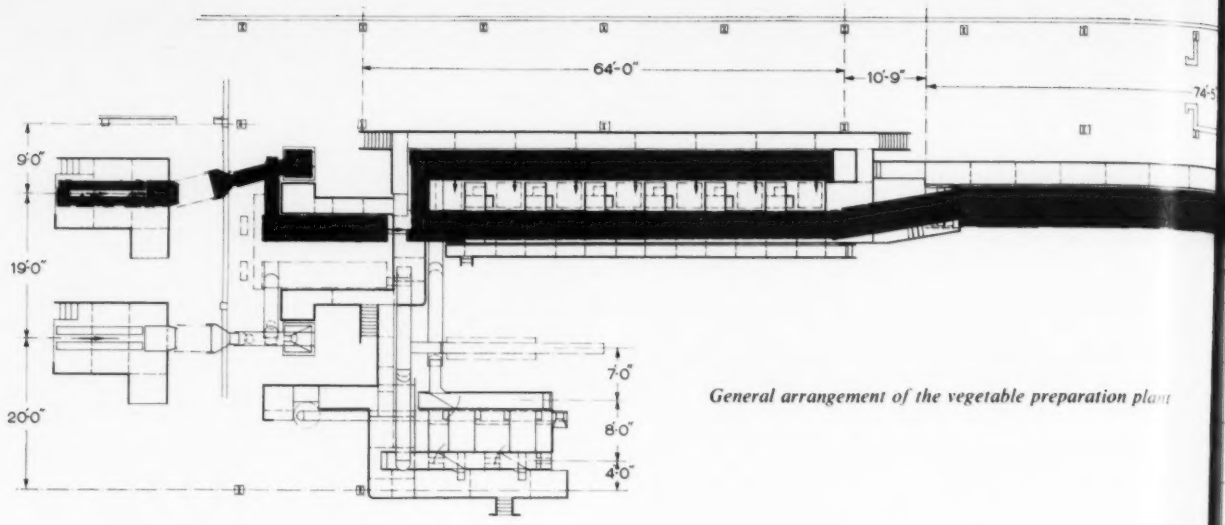
Vegetables leaving the washer on the second line may follow either of two alternative routes. They can be carried alongside No. 1 main screw conveyor, be fed through the same valves to the peelers, and transferred by a separate gathering conveyor to the wide belt for trimming. Alternatively, this line, when used for carrots, can include a loop in which the material is raised to a belt conveyor and ploughed off into one of two topping machines for a preliminary operation before proceeding to the peelers. Tops and tails are dropped through chutes and carried away by a screw conveyor to a waste-collecting system.

When they reach the trimming section the prepared vegetables are ploughed off on to transverse trimming belts where all vegetables are examined and any showing any trace of blemish are trimmed by pickers seated in long rows on either side. Waste is dropped through chutes on to a narrow belt conveyor from which it is transferred to a screw conveyor discharging into a waste-collecting system. The trimmed material remaining on the trimming tables is passed on to screw conveyors that raise it to three 10-ton storage hoppers into which it is discharged after passing over continuous belt weighers.

Each hopper, which will hold one hour's output of trimmed vegetables, incorporates an inclined screw conveyor by which the material is raised up a gradient of 65 deg to the intake level of the cutting or dicing machines that perform the last operation in the preparation of the raw vegetables.

In addition to the system for handling potatoes and carrots, there are two sections of smaller capacity for onions and turnips. Onions are peeled and raised by a continuous bucket elevator to a 1,000-lb control hopper, from which they are fed at the rate of 3,000 lb/hr to a belt conveyor system for inspection and trimming. Trimmed vegetables are raised by a second bucket elevator for discharge to a 3-ton processing silo after passing over a continuous weigher. Turnips are

Cans circulating in mezzanine floor area before going down to ground floor filling stations



General arrangement of the vegetable preparation plant

discharged from two peelers to a similar system operating at a rate of 1,500 lb/hr.

Peas and beans are raised by a continuous bucket elevator to a stoner, extractor, and separator and fed to a short belt for inspection and further sorting. Rice is prepared by inspection and sorting as it travels on three belt conveyors, which are fitted with magnetic drums.

Meat comes from the cold store and is elevated to platform-mounted slicing machines by an inclined belt conveyor running in a stainless-steel trough. Sliced meat is carried forward by a belt conveyor to a mincer installed at the same high level. Oxtails are cooked in retorts before processing. Chickens are carried on trays by galvanized slat conveyors for cleaning and trimming and the dressed chickens are put into tipping baskets suspended from an overhead conveyor. The baskets, spaced at 2 ft 6-in centres, are carried round a closed circuit at a speed of 62·5 ft/min. They are brought down over the loading station and raised again for the return part of the circuit, during which the baskets are tipped automatically to discharge their contents down a chute into the weighing machine and are then passed through a water-spray booth.

More than 1,660 ft of conveyors are in use on these soup-preparation lines. They include some 790 ft of screw conveyors, all of which are fully enclosed, with every lid hinged to facilitate cleaning down. There are also more than 700 ft of belt conveyors. All waste is totally enclosed and is carried away for fluming as soon as it is created. In the meat section, chutes and other metal parts are of stainless steel; elsewhere, most chutes are of stainless steel and all mild-steel equipment is galvanized. Metallic inclusions are removed at every possible stage during the cleaning processes and most of the chutes are fitted with magnets. In the hoppers, and at the end of each screw conveyor, pressure switches are fitted, and one of these switches is capable of exercising an overriding control over the automatic relay system and will bring the machinery to a halt in the event of a build-up due to a stoppage on any part of the line.

Soups are cooked in kettles, which are loaded from above with vegetables and other ingredients. These are carried in hemispherical baskets raised and lowered by electric hoists travelling round overhead runways. Each pair of retorts is served by one hoist propelled by its own motorized trolley round a closed-circuit runway. Liquids are pumped. Butter is drawn off from a melting grid, but will, under the new scheme, be pumped also.

Soup Filling and Packaging

Filling and packaging of soup cans is engineered in accordance with the same principles as those followed in the baked beans section, but involves an installation that is much more complex. During each shift, thousands of gallons of Soups and Baby Foods are filled into cans of different sizes. They are capped, washed, and sterilized, and transferred to eight lines for labelling and packing into cartons. On leaving the automatic carton-packing machines, the packages are loaded on to powered roller curves that take them into a system of belt and roller conveyors designed to marshal the cartons on the eight incoming lines into four lines travelling in the opposite direction for gluing, sealing and warehousing.

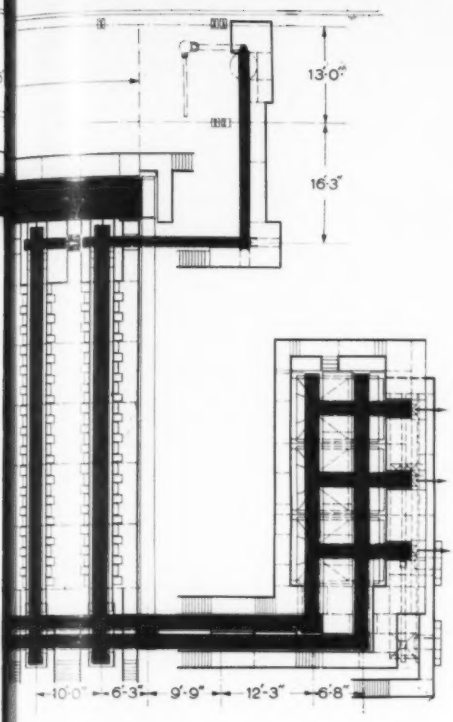
This manœuvre is achieved in the smallest possible space by swinging the cartons round 90-deg bends on the powered rollers and transferring them to inclined belts that flatten out to form bridges over four parallel transverse belt conveyors. By means of stainless-steel ploughs and 'traffic-cops' operated by micro-switches and solenoids, the packages are diverted via curved rollers on to the transverse belts and brought back through another right angle to the gluing and sealing lines. Bottom and top flaps are sealed simultaneously as the cartons are carried between pressure belts, and the packages are carried on up inclined belts straight into the warehouse.

Despite the intricate appearance of this tight maze of junctions, the system is entirely flexible, and can accommodate alterations in the incoming or outgoing flow. Space has, in fact, been made available for the inclusion of additional lines.

Storage and Warehousing

Storage and warehousing areas occupy almost as much floor area as that allocated to production, the ratios being 330,000 sq ft for food production: 310,000 sq ft storage; 60,000 sq ft for can-making, maintenance and workshops.

In contrast to the other departments of the Kitt Green factory surrounded by their curtain walls of glass, the storage block is enclosed by solid walls of bricks, relying upon texture and proportion for visual effect and providing an artificially lighted interior consisting almost entirely of clear space divided horizontally to form a first-floor store for raw materials and a ground-floor warehouse for finished goods. Incoming vehicles climb a ramp, electrically heated in winter to prevent frost-formation and melt the snow as it falls, and unload their boxes of meat and chickens or sacks of vegetables at the nearest possible point to the preparation plant.



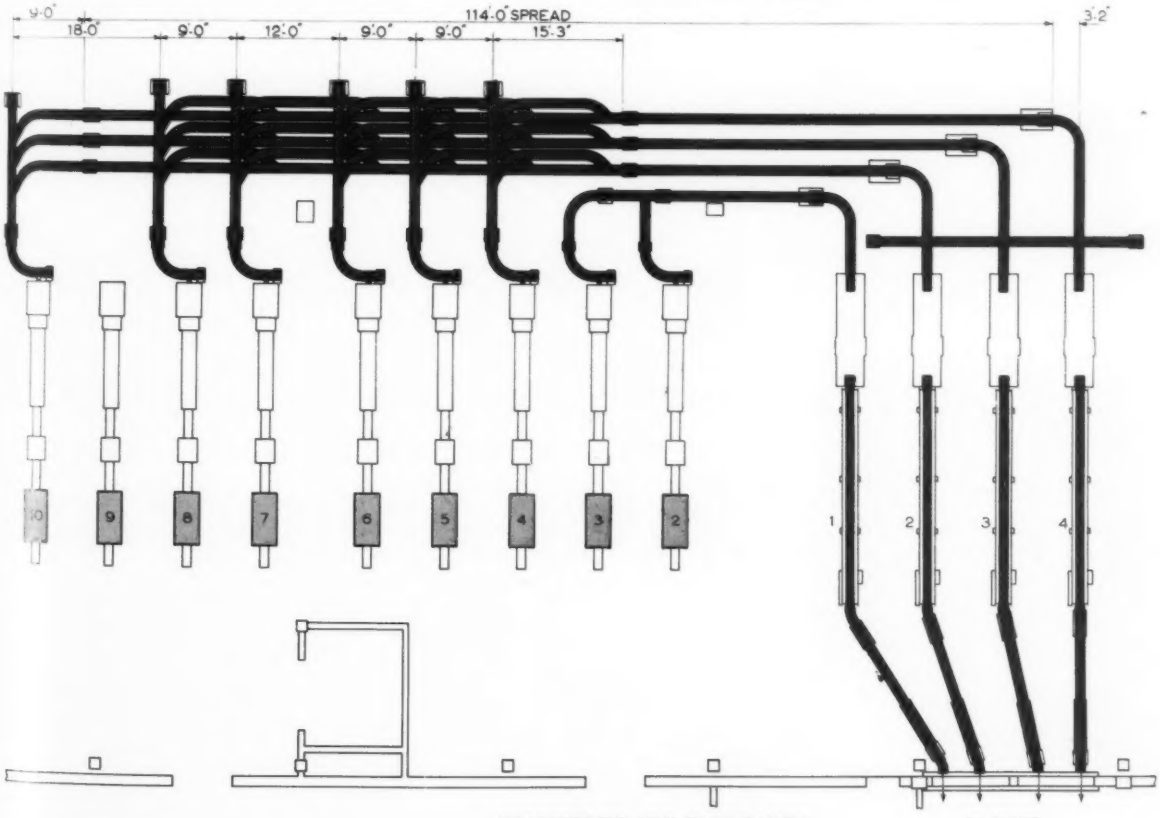
A high proportion of the incoming raw material arrives on pallets. Beans, for instance, are palletized at the docks; many of the vegetables are palletized at farms growing these crops exclusive for Heinz often from Heinz seed. The standard pallet throughout the organization is a two-way 40 in x 48 in, which can be used to carry 36 100-lb sacks of 'navy' beans or 1-cwt sacks of vegetables in the raw materials store or 30 cwt of canned goods in the warehouse. At the time of writing, pallet loads of raw and finished materials were being tiered three high by battery electric fork lift trucks. But Heinz have decided, as a result of successful trials, to equip their warehouse trucks with 19-ft masts and make full use of the available space by stacking to an overall height of 25 ft. The weight of the unit load can range from about 10 cwt for a load of herbs to a maximum of 3,800 lb, and the model unit weighs approximately 30 cwt.

Meat and fresh vegetables are stored in refrigerated rooms; pre-frozen meat in a cold store at a temperature of 10 deg F, and vegetables, chickens and other meat that has not been frozen in three cool rooms held within a temperature range of 32-35 deg F. In these areas also, the goods are on pallets.

Raw materials are taken from storage to production areas on their pallets, and finished goods are palletized as they come off the packaging lines. Pedestrian-operated electric pallet trucks are used to bring the unit loads to the production areas and to take back the empty pallets. They are used also to handle tinplate in the can-manufacturing building, which is reached by its own access road.

Following the logical principle on which production planning is based, packaging materials are stored and prepared for use on the first floor and delivered by chutes to the points at which they are needed on the packaging lines. Thus all major raw materials enter the factory at the places from which they can be taken forward into production and finished goods continue their forward movement to the warehouse

Below is a diagrammatic layout of the conveyors for soup packing lines



Filling line on ground floor fed with cans and food product brought down through the mezzanine floor

from which they are despatched. Empty pallets and sacks are moved backward, but over a short distance only, on the pallets on which the materials were loaded. Most of the pallets are returned on the delivery vehicle for re-use on the quayside or farm.

In achieving a degree of palletization that is quite exceptional, Heinz have eliminated the areas of non-mechanization that lie hidden behind many fully automatic manufacturing departments, branding them as façades. They have 26,000 pallets in service, and this large investment has enabled them to use their advantage as bulk buyers to introduce the unit load at the earliest and most effective stage.

Carrying the Cans

The cans that dance inside the glass walls of the production building in the endless silver stream are produced automatically by can-making machines operating in synchronism at a throughput rate of 300 cans a minute. They are carried forward from one operation to the next by conveyors of the type evolved in the can-making industry, in which the required combination of precision and flexibility is achieved by ingenuity in the use of a conveying medium of the utmost simplicity. Optimum use is made of gravity and where propulsion is needed it is effected by a light chain or wire rope. Steel sheet is used to guide the parts along their various routes, and manipulation is effected by the simplest of means—the touch of a projecting finger or a twist in the channel.

The body-forming sequence begins with the slitting of sheets of tinplate by duplex machines fitted with stacking attachments, followed by the transfer of the stacks of blanks to a self-feeding machine, which forms each blank into a cylinder and locks it down the sides to form a seam. At this stage a conveyor takes over and carries the parts through the heating, soldering, and cooling processes for the side

View of packaging section showing continuous movement of cans through Purdy labelling machine and Varley-F.M.C. case-packer

seam, the fixing and sealing of the bottom ends and, finally, the air-test on a giant wheel round the periphery of which the cans are clamped, with their open ends sealed, while their seams are tested by pumping in compressed air until the pressure rises to the required level. Cans failing this test are automatically rejected. The rest are carried through the covered gantry to the mezzanine floor of the production building from where they are brought down vertically through the ground-floor ceiling and washed and fed to the fillers.

Acknowledgment

The author is indebted to the directors of the H. J. Heinz Co. Ltd. for the hospitality they have extended and the facilities afforded for the gathering of material for this article, and takes this opportunity of thanking members of the staff at Kitt Green and Harlesden for the great courtesy they have shown and the trouble they have taken in arranging facilities and providing information.

APPENDIX I

Principal Equipment in Preparation and Manufacturing Plant for Oven-Baked Beans

Dry-bean Section, Set-bean Section and Sauce Making Plant. Henry Simon Ltd., Stockport, were responsible for the installation of the dry-bean section of the bean-preparation plant and the design of the control panel.

The Metal Box Company Ltd. designed, manufactured and installed a complete handling system of cable runways, gravity conveyors with some ancillary equipment for the can making lines, movement of empty cans into the can filling factory, to the seamer/fillers, and thence to the processing and labelling units.

Varley-F.M.C. Ltd. were responsible for the wet-bean section, in particular the bean-blancher.

Can Runways, empty and filled	Metal Box Co. Ltd.
'Celectric' electronic colour-sorting units	Devices (Sales) Ltd.
'Cintel' metal detector	Cinema Television Ltd.
Continuous bulk weigher	Richardson Scale Co. Ltd.
Counter	Hardings (Leeds) Ltd.
Dravers Ebert Feeder, from silos	Varley-F.M.C. Ltd.
Dust Extractor	Dallow Lambert & Co. Ltd. 'Dustmaster', Varley-F.M.C. Ltd.
Electrical Switchgear	George Ellison Ltd., Brookhirst Switchgear Ltd., The Donovan Electrical Co. Ltd., Square 'D' Ltd.
En Masse Conveyors	Redler Conveyors Ltd.
Flow-Control Valves	Short & Mason Ltd.
Guards	Potter & Soar Ltd. Arden Ltd.
Hoppers	E. G. Brown & Co. Ltd.
Hydro de-stoning units and de-watering units	Mitchell Engineering Group Ltd.
Magnetic Separator	Rapid Magnetic Machines Ltd.
Pneumatic-tube conveyor	Lamson Engineering Co. Ltd.
Sack-tippers—standard hydraulic vehicle loaders modified to produce tipping action in addition to lift and swing	A. J. Mackaness Ltd.
Stainless Steel Pipework and Fittings	Realm Engineering Works Ltd., Talbot Stead Tube Co. Ltd., S. Dixon & Co. Ltd.
Installation work	Arthur Scull & Sons Ltd.
Stainless Steel Tanks and Ducting	Metal Propellors Ltd. A.P.V. Ltd., Metaducts Ltd.
Stainless Steel Pumps	Mono Pumps Ltd.
Steelwork and platforms	Peirson & Co. Ltd. Fredk. Braby & Co. Ltd.
'Tektor' electronic level-controllers on storage tanks	Fielden Electronics Ltd.
Vacuum Extraction	British Vacuum Company
Vibratory conveyors	Geo. Driver & Son Ltd.

Part of the Pantin system of conveyors and ploughs by which cartons of canned soup are marshalled and redirected

APPENDIX II

Soup Preparation and Manufacturing Plant

Vegetable preparation plant; Meat and Chicken preparation plant; Cooking plant. W. & C. Pantin Ltd., Epping, manufactured and supplied the entire system in the Vegetable preparation plant of screw and belt conveyors, continuous bucket elevators, and storage hoppers, and the associated structural steelwork, and were responsible for the erection of the plant. This firm also manufactured and supplied the belt, slat and overhead chain conveyors in the Meat and Chicken preparation plant, and were responsible for all handling equipment in these plants. Subsidiary handling equipment is listed below:

Blanchers	George Scott & Sons
Continuous Belt Weighers	Adequate Weighers Ltd.
Dicers	Varley-F.M.C. Ltd.
Hoist Conductor Rails	British Insulated Callender's Cables Ltd.
Kettles	A.P.V. Ltd.
'Lo-hed' electric travelling hoists	Taylor Stoker & Co. Ltd.
Mincers and Meat Saws	J. C. Wetter & Co. Ltd.
Pulpers	Robt. Kellie & Son Ltd.
Steaming Retorts	George Hopkins & Sons Ltd.
Steaming Retort Baskets	Thos. Marshall & Sons Ltd.
'Syntron' Vibratory feeders	Riley (I.C.) Products Ltd.
Vibratory Equipment	Pegson Ltd.
Washers	Cocksedge & Co. Ltd.

Part of the ground-floor warehouse. Here, as elsewhere at Kitt Green, palletization is complete

APPENDIX III

Can-filling and Packaging Plant

Can-filling, Sealing and Sterilizing plant; Packaging plant.

Automatic can-extraction equipment for tomato pulp and 12-pocket bean filling heads	Hammond Smallden & Co. Ltd.
Busse basket loader and unloader	Lifting Equipment Ltd.
Can Conveyors	Metal Box Co. Ltd.
Can Closing Machines	
Can Washers	Metal Box Co. Ltd., Metaducts Ltd.
Case counter	Counting Instruments Ltd.
Filler-to-seamer hook-ups	Metal Box Co. Ltd.
Heavy-duty roller conveyors, sterilizing section	Rownson (Conveyors) Ltd.
High-speed Can-filling machines	Varley-F.M.C. Ltd. Mather & Platt Ltd. Sheepbridge Equipment Co. Ltd.
'New-way' Can-filling machine	Purdy Machinery Co. Ltd.
Non-shock automatic case-packers	Varley F.M.C. Ltd.
Retort Instruments	Taylor-Short & Mason
Rotary Can-filler, 24-head	International Machine Corporation, S.A.
'Standard-Knapp' case gluers and compression units	Mather & Platt Ltd.
Slat Chain Conveyor	Hammond Smallden & Co. Ltd.
Sterilizing Retorts	The Leeds & Bradford Boiler Co.
Sterilizing Baskets and Plates	Mather & Platt Ltd. Metaducts Ltd.

APPENDIX IV

Storage and General-purpose Equipment and Accessories

Automatic can-making machinery	E. W. Bliss (England) Ltd.
	Dewey & Almy;
	Hoe & Crabtree Ltd.
Battery Chargers	Legg (Industries) Ltd.
Can Balers	Greenwood & Batley Ltd.
Electric Motors, production plant —Drives (Starters)	Lancashire Dynamo Crypto Ltd.
	Crompton Parkinson Ltd.
	The Donovan Electric Co. Ltd.
Food containers	Fredk. Braby & Co. Ltd.
	Crawford Stainless Steel Co.
	Warwick Productions
Gears	Allspeeds Ltd.
	Carter Gears Ltd.
	Stone Wallwork Ltd.
	Crofts Engineers Ltd.
General Installations	B.R.S. (Pickford) Ltd.
Hand Trucks	Arden Ltd.
	Willmott Trucks Ltd.
	Tubewrights Ltd.
	H. C. Slingsby Ltd.
Meters	Measurements Ltd.
Mixers	Peerless & Ericsson.
	D. J. Osborne & Co. Ltd.
	Mitchell Engineering Group Ltd.
	Wm. Gardner & Sons Ltd.
Hand-lift Pallet Trucks	I.T.D. Ltd. ('Portapal').
	Industrial Machines & Equipment Co. (Brimpex) Ltd.
Scales	Pooley Ltd.
'Stacatruc' electric fork lift trucks, 45EH/14 in warehouse, 40EH/12 in raw materials store, 40EH/6 with side-shift on horizontal retorts	I.T.D. Ltd.
Stainless Steel Equipment	Isaac Webster & Sons Ltd.
	C.P. Equipment Ltd.
Stainless Steel Pumps	Midland Dairy Machines Ltd.
	Howard Pneumatic Engineering Co.
	Mono Pumps Ltd.
	Albany Engineering Co. Ltd.
Stainless steel vessels and tanks	The A.P.V. Co. Ltd.
	Metaducts Ltd.
'Tidal' controllers	Redler Conveyors Ltd.
Travelling chain-blocks, battery-charging area	Felco Hoists Ltd.
Two-way wooden pallets	W. C. Youngman Ltd.
'Warehouser' pedestrian-operated pallet trucks	The Yale & Towne Manufacturing Co.

MOVING A MAINTENANCE STORE

By Leonard E. Bunnett, M.I.PROD.E.

THE EFFICIENT STORAGE of maintenance spares presents problems which are different from those connected with manufacturing spares and if the plant concerned is one that is running day and night throughout the year the problems are more difficult and require careful planning and strict discipline in their solution.

The Problem

The following case history comes from a processing plant where much of the equipment is not duplicated but is in continuous operation. A system of planned maintenance was already in being but the stores of spare parts, replacement parts, obsolete parts, used parts and doubtful parts were housed on an upper floor in a corner of the works. The spares were mostly stored in old wooden racks and boxes though a few modern metal racks had been introduced. They were in the care of an experienced storekeeper who knew where he put things but could not be responsible for what happened in his stores during the night.

The management decided to spend capital on a new single-storey building more centrally situated and suitably equipped to house this heterogeneous collection of spares which would later be moved into it. It was realized that the exercise of keeping the plant going and at the same time of moving the old stores would need to be planned like a military operation and the advice of a consultant was obtained.

For a clear understanding of what follows it should be noted that the word 'spares' is used for any item held in the stores be it a split pin or a valve of special make for a special piece of equipment and that the words 'common parts' and 'special parts' are used to distinguish between such items as split pins and proprietary valves.

Long-term Requirements

The essential requirement was to arrange the stores in such a manner that any spare could be immediately located. This had to apply even in the middle of the night when a fitter might search for some part during an emergency breakdown. In addition there had to be adequate protection of the spares held and some suitable system of re-ordering without introducing elaborate paper control.

Inventory

No perpetual inventory is maintained of the spares but all purchases are recorded on cards in the Buying Office and lists were made of all the titles on these cards arranging common parts in alphabetical order and special parts in groups under the heading of the equipment for which they were intended. These lists were carefully edited to eliminate obsolete parts and finally arranged in two sections: 'Common' and 'Special'. The total number of titles approached two thousand.

It was decided not to attempt to take stock physically which would entail handling each part before the move took place but the lists were analysed to discover the different types of stowage which would be needed and, in conjunction with visual examination of the physical parts, an approximation of the volume which would be used of each type of stowage.

Stowages

It would have been an uneconomic luxury both of bins and space to attempt to provide the ideal stowage for each variety of spare. The spares include such diverse items as paper gaskets, 5-in diameter rubber hose and wire screens. The stowage requirements were therefore divided into broad groups: open bins; cupboards and shelving; drawers; racks, pegs and hooks; the floor.

The main criterion in choosing proprietary makes of stowage or in designing special gear which was made in the maintenance shop was to provide the maximum display of spares. The plant works continuously night and day and fitters have access to the stores throughout the night. They frequently have no idea of the name which an item goes under on the maker's invoice but they know precisely what the spare looks like and may well be carrying the broken part in their hands. It would have been useless therefore to provide index cards and number the bins; as far as possible every special part can be seen in walking round the store.

Fig. 1. Examples of hooks and pegs made for hanging items

Open Bins

A large number of the bins are open fronted and all of these have sloping shelves and a ledge front. This enables the majority of their contents or at worst a sample of each spare to be instantly recognizable.

Cupboards and Shelving

Flat metal shelving is used for some of the larger items such as coiled belting and liquids which would be inconveniently stowed on sloping shelves. Some of the shelving is in locked cupboards. These contain items such as saw blades and files which are normally only procurable during the day from the storeman who holds the key and keeps note of his issues. Some special items of great value are also kept in locked cupboards but their contents are well known to the foremen who have keys for all stores.

Drawers

These are required in the main for small common parts which

do not need to be displayed visually but are labelled. Proprietary types of drawer were chosen. In one type the drawer is a tote pan which is so designed that it cannot be accidentally pulled right out. These are used for items such as black nuts which are bought by the sackful. The storeman keeps one drawer full in its proper sequence in the racking but he may have the remainder of the new consignment already out of the sack and in tote pans as his reserve store. The racks for these pans are 2 ft from back to front and the pans can be obtained in depths of either 1 ft or 2 ft, so by making the racking accessible from either side, a combination of drawers is obtained on both sides.

Another type of drawer is used for small items which has internal slots which take metal dividers in various positions. These make the best use of space for items such as 4 B.A. nuts which are only wanted so rarely that a stock of a dozen suffices. Most of these drawers bear labels but where they contain special parts a sample is wired on to the handle.

As far as is possible, all rubber items are housed in closed drawers to prevent deterioration.

Racks, Pegs, Hooks

Chains and blocks, wire ropes, vee belts, all require hanging in some way from the walls or roof and in a low store tubes and metal bars need some kind of hooks or pegs so that they may be stowed horizontally. Conventional racking was suitable for straight bars and tubes; care being taken to arrange the floor plan in a way which made it possible to get them in and out.

The space occupied horizontally by chains, wire ropes or vee belts varies enormously and if hooks are fixed at regular intervals there is a great wastage of storage space. The particular wall in the store where these articles were to be housed was of breeze blocks and some sort of steel framing was essential to carry the weight of spares. A length of M.S. angle was suitably erected about 5 ft above the level of the floor for the whole length of the available wall. A number of hooks and pegs were made by the smith to the design shown at Fig. 1. Most articles mentioned are conveniently hung on these hooks but some rolls of strip material hang better on pegs. Both pegs and hooks can be slid along the angle bar or can be removed and placed in a new position.

Coiled armoured hose is very awkward to store and for this angle iron racks were made rather like giant book racks as shown at Fig. 2. This type of rack could have been readily made from wood or from one of the many types of slotted angle. It is important that the divisions in this rack are fairly narrow, as it is quite easy to insert or remove the bulky coils of hose when they are more or less upright but most cumbersome once the hoses get on top of each other.

The Floor

Every effort was made to have nothing stored on the floor. Many items which are too heavy to go on to a bin shelf are kept in the works near the equipment for which they are reserved. Friable articles, such as furnace linings, are another example of items stored at the point of usage. Oils, paints and liquids in drums or carboys were already housed in separate single-storey buildings. Almost the only items which are placed for storage on the floor are large electric motors and one or two large pumps and similar equipment which needs to be under cover. Arrangements are being made to rest these on pallets where possible for easy handling with fork trucks.

The Layout

When the schedule of anticipated equipment requirements was complete, a plan of the proposed layout was drawn and the new equipment ordered. The floor of the new building was chalked out and as the new equipment arrived it was put in its final position. Meanwhile some of the new tote pans and drawers were being filled in the old stores but left there until 'zero hour'. About half of the spares were housed in old wooden bins and shelves which were discarded. The other half were in usable metal bins which were destined to be moved when the time came.

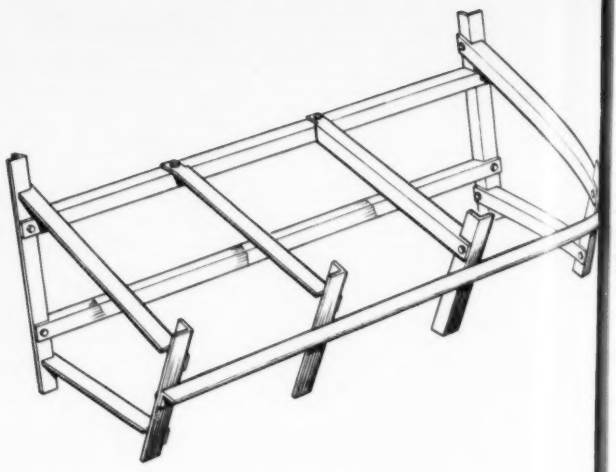


Fig. 2—Angle iron rack for coiled armoured hose

The planned layout consisted of an aisle at one side of the store flanked by the wall which carried the pegs and hooks. Centrally there were bins and shelves across the store. Against the other wall were the racks for tubes and bars. At the front of the store there is a small office for the storekeeper and a serving bench. At the rear is a stairway to reach the floored portion of the roof where coils of hose are kept and there is an emergency exit.

When the move was completed the layout was substantially the same except for bringing in a further row of bins. As usual requirements were underestimated but space had been reserved. All common parts are housed in the foremost rows of bins and conspicuous signs indicate the groups of spares to be found in each alley; e.g. 'BOLTS', 'PIPE FITTINGS'. The special parts are in the more distant bins and these are all arranged in groups under signs such as 'BALL MILL', indicating the equipment for which they were purchased.

Controlling the Move

Before any parts were moved a card index was created on which was entered the item and the position which it was to occupy in the new store. These cards were arranged alphabetically under the two separate groups of common and special parts. They were used for analysis purposes when planning the types and amount of stowage but were essentially used to control the move. When the move actually took place, the buyer, who acted as controller in conjunction with the storekeeper, physically moved the appropriate card at the same time as the parts were being transported to the new store. Thus at any moment there was in existence an exact register showing whether the part concerned was in the old or the new building. Fortunately there was no emergency breakdown but all normal issues were made without any delay.

The Move

Practically the whole move took place on one day. The signal to start was only given when everything possible had been done to provide the new accommodation. The first

bins to be emptied were those which were themselves to be moved into the new store. Their contents were dumped in groups in tote pans and boxes on the floor of the new store. While these old bins were being dismantled and reassembled other spares were being carried to the new stowages already awaiting them. As soon as the old bins were in position their old contents were replaced in them to get the floor clear and then work was resumed on the remaining items. Some of the temporary labels proved to be wrongly situated and had to be moved backwards or forwards. But every item was housed in its intended group or sequence and in the days that followed the labels were made permanent and the whole place became ship-shape and Bristol fashion. In fact the move worked smoothly and quickly because considerably more time was spent in planning it than in executing it.

Obsolete Spares

In the course of doing maintenance work on a planned basis a part is often replaced in a piece of equipment which has not broken and is not worn out. It is natural for the maintenance foreman to hang on to this old part just in case there should be an unexpected failure of the replacement. The practice had quite rightly been for such parts to be placed in the stores but in consequence there were very many items in the stores which were unknown to the Buying Office and further there were items which had remained there for many years belonging to equipment which had been discarded. All these items were placed on one side when the stores were moved and a committee consisting of the manager and the foreman gave 'on the spot' decisions on all the doubtful items. Those which it was decided to keep were recorded and found proper accommodation in the new store.

Store Ledgers

As was mentioned earlier, the Buying Office maintain a purchasing record of all spares. All issues of special items were recorded on the same card by posting requisitions filled by the workmen or the storekeeper when parts were issued from the stores. No record had been previously kept of those items which went back into stock after being replaced during routine preventive maintenance. It sometimes happened therefore that old but usable parts were re-issued and marked off the Buying Office record as new. Thus these records never gave a true picture of the stocks of spares held. Re-ordering had been largely left to the storekeeper and foreman. By slightly improving the layout of the Buying Office record card and by introducing a Store Return Note to post any items passed back to store as good stock, accurate stores ledgers can now be maintained on spares.

There is no control of issues of the majority of common parts such as black bolts. These are freely used by the fitters and written off as soon as they are purchased.

Re-ordering

Minimum stockholdings have been entered on all records and the Buying Office automatically re-order when stocks of special items fall below a minimum. The storekeeper is responsible for re-ordering the common parts when they fall below a minimum. There is consultation at all times between the buyer, the storekeeper and the foremen to keep the lists of spares up to date and abreast of the works' needs.

SIXTH ANNUAL MATERIALS HANDLING TRAINING COURSE

THE Sixth Annual Materials Handling Training Course held at the Lake Placid Club (U.S.A.) has been declared the best ever. A highly enthusiastic group of 53 students participated in two weeks (110 hours) of materials handling education. Eighteen of the nation's leading authorities met with the group to discuss the advanced thinking and latest innovations in such areas as equipment application, automation, materials handling analysis, warehousing, plant surveys, and organizing the materials handling function.

Students at the course represented 43 companies from the United States and seven foreign countries: Canada, England, Ireland, Norway, Spain, Holland, and Venezuela.

A group of students from overseas taken during the course

Of particular interest was the representation from such unusual operations as three U.S. Navy installations, a British dairy, an Irish brewery, a food chain, several material handling equipment manufacturers, and two universities.

Among the foreign participants were: George Downie of Unilever, Ltd., and winner of the John Morris Memorial Award, sponsored by the British Industrial Truck Assn. (the paper which won Mr. Downie this award, 'How Greater Use of Industrial Trucks can benefit the British Economy', was published in *Mechanical Handling*, June issue, page 339); Charles Manners of the Metal Box Co., Ltd., and former national chairman of the Institution of Material Handling; Prof. Luis Torres, head of the Production Department of the School of Business Administration in Madrid, Spain; Knut M. Haganaes of the Royal Norwegian Council for Scientific and Industrial Research.

A highlight of the course was the series of problem-solving sessions, in which many hours were spent discussing and solving actual plant problems the men had brought with them. Also of interest was the fact that the Second Annual Packaging Training Course was held concurrently and students were able to take advantage of much of the course content of both programmes.

In the six years the Material Handling Training Course has been in operation, over 230 men and 180 companies have attended the programme. They have come not only from the United States, but also from Canada, Arabia, Brazil, Cuba, England, Ireland, France, Mexico, The Netherlands, Norway, Switzerland, Spain and Venezuela. The programme was under the direction of James R. Bright of the Harvard University Graduate School of Business, and James M. Apple, Industrial Management Consultant.

MOBILE SCREENING PLANT "COKE CIRCUS"

by H. M. Lawrence, M.A., M.I.Mech.E., A.M.Inst.Gas.E.*

IT HAS BEEN evident for years that to enlarge the gas coke market or, indeed, even to maintain it against the competition of other domestic and industrial fuels, one of the main considerations must be the grading and cleanliness of the product. This is comparatively easy on large Gas Works using well-designed static grading plants, provided that they are not overloaded. In times of stress, however, and when the coke has to be put out to stock in times of low demand, an additional means of screening is required, particularly since it is difficult without extensive modification to regrade or debreeze coke brought out of stock through these static plants. This problem is exaggerated, of course, on smaller country works where, in some cases, little or no screening plant is installed. For this reason, in the Southern Gas Board, it was decided to design a plant to provide this extra grading.

Since at that time some of the works had different power supplies or, indeed, none at all, it was necessary to make this plant completely transportable to go from works to works, and completely independent of sources of power. These two advantages would also make the plant useful on the larger works when operating on the stocking grounds remote from main supplies. A further consideration was to introduce the utmost flexibility into the plant and to make the various units light enough to be easily transported by lorries or tractors or to be manhandled, if necessary, on the stocking ground.

Since it was proposed to transport this conglomeration of units on a convoy of vehicles and to make it independent of outside sources of power, similar to a showman on the move, the name 'coke circus' was coined for the assembly. The idea was to design the various units so that, in combination, they could form a 'circus' and separately could perform a useful function for individual handling or screening operations.

During the past few years the Southern Gas Board has undergone a large reorganization and many small works have been closed and production centred in larger units. New methods of gas manufacture have been introduced and oil refinery gases utilized, resulting in a reduction of coal carbonization. This changing pattern has brought some problems in its wake, one being the maintenance of an adequate supply of various grades of coke in areas where production has ceased. This requires that large quantities of coke have to be moved and put into stock; later to be picked up when the winter load comes on.

The requirements for which the coke circus was originally designed have, therefore, changed, but the flexibility of the design has enabled the Board to make full use of the component parts, either combined as a circus or individually.

Following experience in the field, the usefulness of the circus has been greatly enhanced by adding portable loading

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Fig. 1. *Mobile screening plant in normal operating trim*

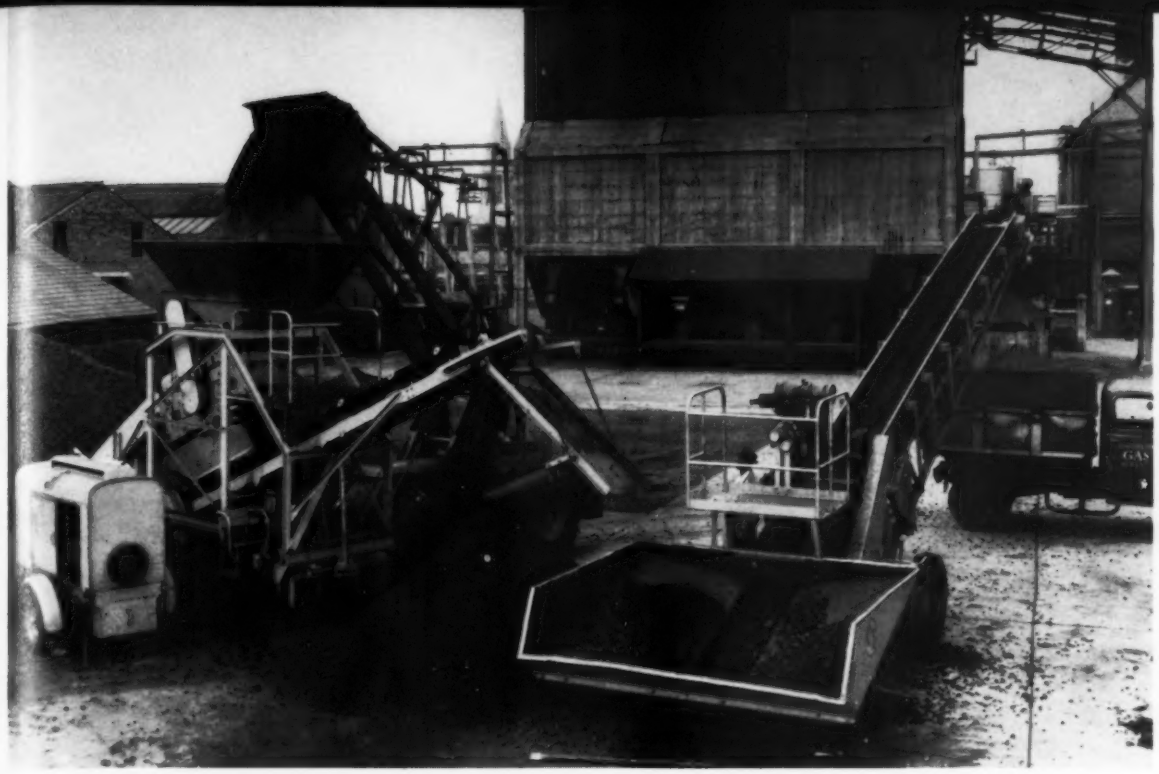


Fig. 2. Screening plant altered in layout to suit confined spaces

hoppers to which the various conveyors discharge, and attaching to these loading hoppers weighing machines and automatic sack lifters, so that coke can be picked up from stock in bulk, delivered to the plant, and screened and loaded direct in sacks on to lorries for sale in one continuous operation. It is equally useful to be able to do this on a stocking ground belonging to a large works as it was on a small works for which the plant was originally designed.

It is necessary to have road transport within legal limitations, and all the component parts fitted with the requisite braking systems can either be loaded on to a lorry or towed behind it.

Messrs. Crone & Taylor were consulted regarding the requirements of the Board and actively co-operated in the development of the plant. The order for two circuses was placed with this firm and delivery was effected during the spring of 1956. The final specification for the plant was as follows. Mobile coke screening circus to have a capacity of 10/15 tons/hr:

1. Mobile double deck screening unit incorporating a 6 × 2-ft vibratory screen fitted with 2 and $1\frac{1}{4}$-in mesh screen decks. The maximum lump size which the screen is capable of handling is approximately 5/6-in cube. The unit is powered by a 5-h.p. totally-enclosed, fan-cooled squirrel cage electro motor controlled by star-delta starter fitted with normal overload and no volt protection. The coke nuts passing through both decks are removed from the unit by means of a built-in conveyor with 18-in wide troughed belt. A detachable screen attachment having $\frac{3}{4} \times \frac{3}{8}$-in mesh to separate nuts and breeze minus $1\frac{1}{4}$-in plus $\frac{3}{4}$-in and minus $\frac{3}{4}$-in is fitted to this conveyor. To this screen is fitted an electric vibrator. The oversize products are discharged to the rear of the unit by twin M.S. chutes each of which is supplied with a removable bottom plate.

2. 40-ft centres by 24-in wide standard *Walrus* loader with Armstrong Siddeley air-cooled diesel engine drive. This machine is capable of accepting a feed from ordinary tipping lorries and for a maximum rate of capacity of 120 tons/hr of material at 50 lb/ft^3, but equipped with change sprockets to reduce the capacity to that of the screening unit, i.e. 10-15 tons/hr. The discharging height of the loader is between 3 ft 6 in minimum to 14 ft maximum, thus enabling it to discharge into a screening unit of much lesser height if desired. The movement of the boom is hydraulically operated by hand pump.

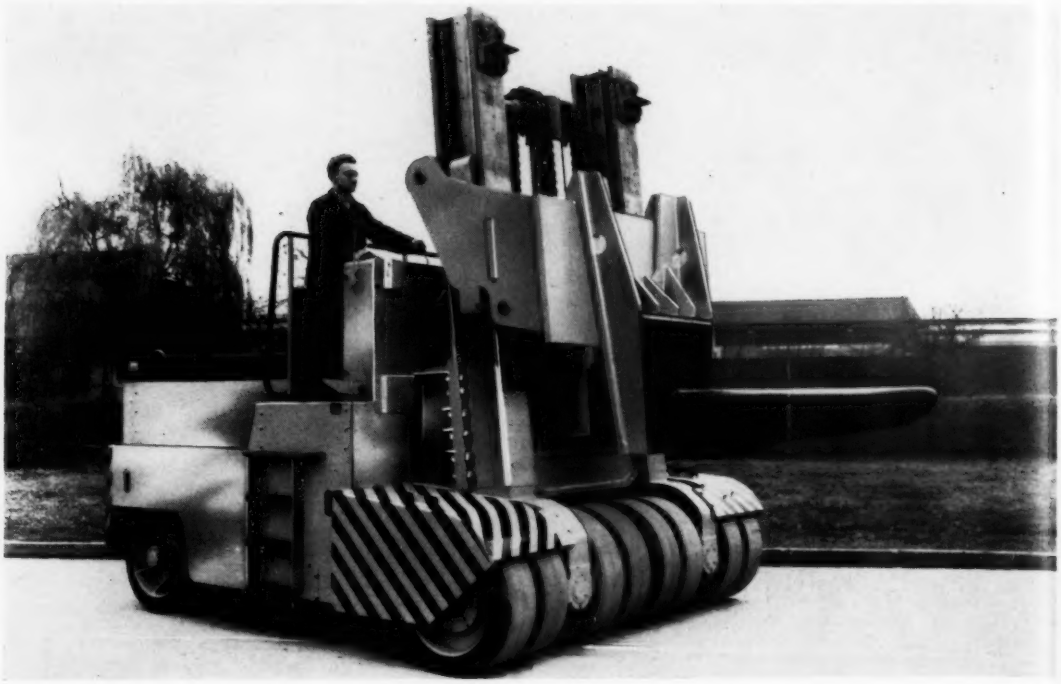
3. Two 30-ft centres by 18-in wide troughed belt tubular stackers fitted with 3-h.p. electric drives. These machines are fitted with pneumatic main wheels and height adjustment is by means of hand-operated screw elevating gear. The conveyors are provided with small feed hoppers suitable for accepting the two oversize products from the screening unit chutes.

4. 10-kW diesel alternator set giving a supply of 400 V, 3-phase 50-cycles. This unit includes an air-cooled diesel engine of Armstrong Siddeley manufacture direct coupled by an alternator set equipped with the necessary instrumentation and control gear. The unit to be housed in a weatherproof enclosure and mounted on a trolley fitted with pneumatic wheels and tow bar, fitted with overrun brakes, making it suitable for towing on the road.

Fig. 1 shows the equipment in normal operating trim. One of these units has operated as base load plant at one of the larger works for the last two years. For the second unit it was found, however, that where the problem was confined only to debreezing coke picked up from the ground, it was a simple matter to remove one of the decks and to fit a debreezing screen. One of the units was modified in this manner and worked at another large works.

The equipment as illustrated quite obviously occupies a large area of ground and it has been found that in certain confined areas it was necessary to alter the layout. Fig. 2 shows this. It will be observed that the two 30-ft conveyors have been eliminated and the screening unit is fed by a *Supalift* Muirhill shovel. The 40-ft stacker has changed its role and now feeds the high-capacity coke lorries instead of the screening unit.

EUROPEAN FORK LIFT TRUCK



The Esslingen 25-ton capacity electrically driven fork lift truck, model ESS 25. This truck is fitted with a ram for handling coiled steel. Tilting forks are available as alternatives

A NEW SOURCE for extra heavy fork lift trucks in Europe has been opened up by the introduction of a 25-ton truck made in Germany by Maschinenfabrik Esslingen. It is marketed in the United Kingdom by Omic, Ltd.

The truck is based on the wide experience gained in manufacturing a range of trucks with capacities varying from 0·6 tons to 15 tons, all of which have been on the market for some years. There is, therefore, a long tradition of success in the fork lift truck field, which is reflected in the design of the new truck, known as the ESS 25. This truck is available with battery driven, diesel-electric or petrol-electric power units. The main employment for the heavier type of fork lift truck is found in the handling of steel coils in steel mills. The model illustrated is electrically driven and is fitted with a ram for this purpose and has a capacity of 25 tons at a maximum load centre of 39¾ in. Drive is by two electric motors, each coupled by reduction gears to an independent floating axle. Each of these axles is carried on two driven wheels and two idling wheels, and a flexible coupling is provided between the reduction gears and the driving axle gears. An interesting feature is the provision for coupling the idling wheels to the driving wheels mechanically when extra adhesion is required.

The steering wheels are also driven by two electric motors, power being transmitted by gearing through differentials to the two independent floating axles. These steering axles are each carried on two steering wheels, each assembly bearing a steering axle support with its floating suspension. Steering is fully hydraulic and is by hand lever, and this, together with the other controls, can be provided both on the left- and right-hand sides of the driving platform, thus giving the operator a good field of vision in all circumstances.

As an alternative to the battery electric power unit, a diesel-electric unit is available with an output of 50 kW. A 6-cylinder diesel engine of 120 h.p. by MAN is coupled to two D.C. generators which provide the necessary current. Engines using other types of fuel are also available as required.

Braking is hydraulic, operating on the driving as well as the steering axles. Control is by a foot-board based on the 'Dead man' principle. When the foot-board is depressed, the brakes are released, and when the foot-board is free, the brakes are automatically applied.

The mast of the 25-ton truck, in common with that of the 10-ton and 15-ton models, is rigid, and is not provided with a tilt. To compensate for this, a tilting fork assembly is available, providing these three heavy-duty trucks with the same useful tilt as is usually associated with trucks of smaller capacity.

THE FIX SEE-IT-ALL SYSTEM REVIEWED

T. W. HIGHGATE

Fig. 1. Fix storage system in a warehouse

Fig. 2. Fix storage system in a light assembly shop

Fig. 3. Fix unit containers built up into stacks on wooden pallets

WHAT IS claimed to be an entirely new and unique system of flexible unit storage is now available in Britain from Kimbell Machine Tools, Ltd. Basically, the system consists of a variety of unit load containers of improved tote-box type, so dimensioned and engineered as to be highly suitable for the handling of a wide range of materials, from small turned parts to chemicals, and incorporating facilities for stacking, classifying and handling by truck, trolley, crane or conveyor.

Fix unit load containers are available in a range of different materials, including steel, polythene, polystyrene and nylon, the plastic containers being available in a number of easy-to-identify colours. The system is stated to be protected by more than 50 patents.

The report which follows describes the Fix range of flexible unit storage equipment.

Self-stacking in Six Sizes

Fix unit load containers are all similar in general design, with robust constructions, rectangular cross-sections of storage space and self-stacking facilities. They have semi-open fronts. These are designed to facilitate help-yourself hand serving, easy recognition of contents, appraisal of level of contents, and readability of identification tags.

Fix unit load storage containers are available in six standard sizes, dimensions of which are given in Table 1. All six are available in hot-dipped galvanized steel or in stove-enamelled steel. The three smaller sizes, i.e. Nos. 4, 5 and 6, are also available in polythene, high-impact polystyrene or nylon, in red, yellow, blue and green.

Table 1. Standard sizes of Fix unit load storage containers

Size No.	Length overall major/minor in (base)	Width overall in	Height overall in	Cubic capacity	
				cu. ft.	cu. in.
1	28/24¾	19	12	2·83	4,891
2	20/17¾	12¼	8	0·86	1,490
3	13¼/12	8	8	0·4	678
4	9/8	6	5	0·113	196
5	6¼/5¼	4	3	0·0271	47
6	3¾/2¾	4	2	0·008	14½

Fig. 4. Close-up view, showing ease of handling and identifying of contents of Fix containers in a stores

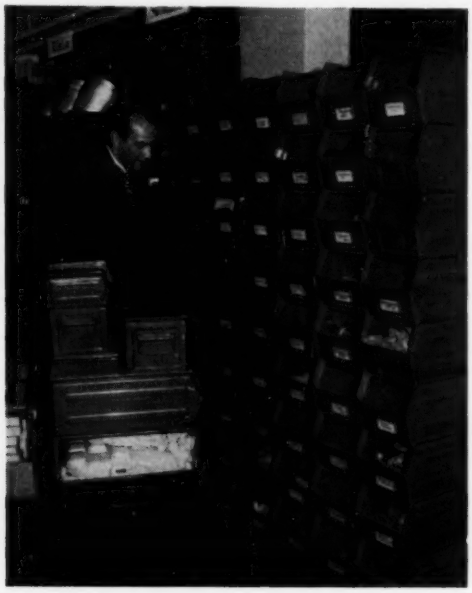


Fig. 5. Fix storage units self-stacked nine-high in a stores. Note larger Fix units on trolley

The larger containers are provided with second support bars to permit handling by fork truck, hoist or crane. Vertical dividing partitions can also be incorporated in the three larger sizes, permitting each to act as a dual-material storage or transit-handling unit.

Self-stacking is obtained by sliding a Fix storage unit into runners built into the top of the unit immediately below it in a stack. Each unit is stated to be immensely strong, and the only limit to the number of units which may be stacked one on top of the other and fully loaded is the permissible floor loading. The great advantage of self-stacking is the ability to build temporary or permanent storage systems to suit space availability and satisfy specific storage requirements, concentrated storage points being generally quite easily located where most beneficial.

Shelf Units

In addition, Fix units may be stacked in shelf units, each designed to take a 5-ton load. These shelf units are also part of the Fix system. They are available in a variety of types and are simple to erect, no bolting or screwing being required. Shelf units can be arranged to frame windows and doors. Special support pillars of high load-carrying capacity are also available, for use over doors and passages, to support bridge-type shelves, for storage of lighter articles. Heavy-duty shelf units, also available, have load capacities of 8 tons each and are similarly self-stacking. These are suitable for large semi-finished items, jigs, press tools, etc. Handling is simplified by two other Fix specialities, a trolley for manœuvring storage and shelf units, and Fix pallets for fork truck handling of larger Fix storage units.

The dimensions of the six sizes of Fix container have been selected to enable different-sized units to be combined with one another, thus enabling maximum use to be made of available space. It will be realized that where containers are stacked in shelf units, etc., it is a simple matter to remove selected containers for transit to a workshop, etc. *In this way, production and assembly stores are easily linked with mechanical handling systems and with temporary storage points alongside machine tools, assembly lines, etc.* For light assembly work, use can be made of the Fix Assistant, a type of shelf unit easily loaded with removable storage units. as shown on the assembly benches.

Fig. 7. Fix size 0 self-stacking shelf units in a warehouse. These have no nut and bolt fixing devices and can be fitted with additional dividing shelves and vertical partitions

Fig. 6. Method of stacking Fix storage units at the point of actual production, assembly or servicing

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Fig. 8. *Fix size* 1 *self-stacking shelf units employed for press tool storage in a factory. As can be seen, they are easily handled by fork truck. The units are extremely rigid and hot-dipped galvanized models have stacking load capacities of* 6 *tons*

Fig. 9. *Handling Fix self-stacking containers by fork truck. The containers are very strong and rigid and designed to support loads consisting of stacks of fully loaded identical units. Stack stability is such as to permit fork truck handling without the use of additional clips, etc., at the top of the stack*

Fig. 10. *Method of fixing Fix containers to wall-mounted rail supports, to allow each container to be handled separately, while allowing free access to all. A range of rail supports is available, corresponding to different-sized containers*

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Fig. 11. *Delivering Fix containers by fork truck. These self-stacking containers have transport covers and they are seen coming in to store from an outside supplier. The covers are removed before stacking the containers. The covers are then either returned to the supplier or kept for further use*

Fig. 12. *General view of electrical assembly benches in a factory, showing Fix Assistant units, railed units for Fix containers loaded with assembly components, two or three sets being in front of each of the operators shown*

Fig. 13. *Palletized stacks of Fix self-stacking containers, with* 10 *or* 12 *containers per pallet. Small work components are, in this way, broken down into* (*a*) *pallet loads, and* (*b*) *unit loads, both designed for easy handling*

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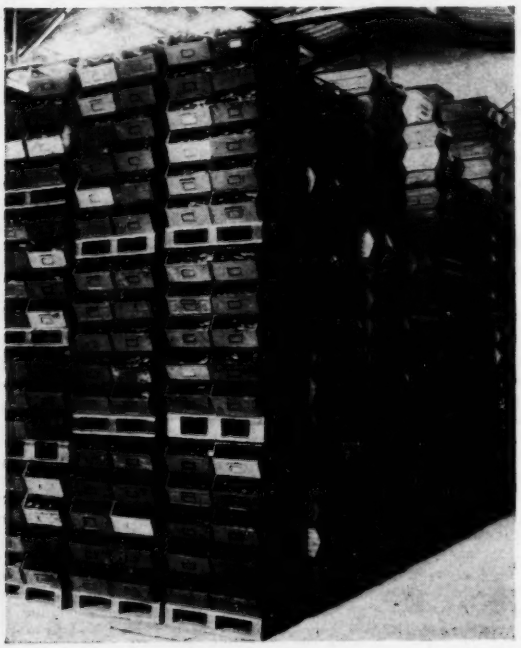


A number of optional fittings are also available. These include dividing boxes, dust covers, clip-on cover flaps, filling chutes, suspension clips and retaining clips. Dividing boxes will convert storage containers into beehive containers. Dust covers are available in transparent plastic. Transport covers completely enclose contents of a container; they are fixed with tension clips and drop handles and do not interfere with self-stacking. Suspension clips enable units to be temporarily suspended from stacked units, as in transfer of contents from box to box, and are designed to reduce fatigue. Retaining clips enable stacked units to be secured together.

Contents identification can be achieved in two ways, by using coloured labels, or inclined anti-stoop labels. The former are of plastic in red, yellow, blue and green, for easy colour coding. The latter enable storage unit contents to be read without departing from the erect position, as when glancing along a row of storage units on a shelf.

Where heavy loads have to be stored, roller conveyor-type storage shelves are recommended. These, too, are part of the Fix system.

A survey of mobile conveyors and elevators, portable and transportable conveyors, and similar equipment — Part 18

'NON-FIXED' CONVEYORS AND ELEVATORS

By J. M. BESKINE, B.Sc.(Eng.)

RAPISTAN mobile unit load belt conveyors are made by Manufacturers Equipment Co., Ltd., and consist of a range of standardized multi-purpose models, described as packaged machines, designed to enable maximum economic benefits to be gained from employment of standard conveyor assemblies and sub-assemblies for all applications.

Four models are made, as well as numerous other types of fixed and semi-fixed conveying equipment. An interesting example of Rapistan semi-fixed conveying equipment is their bench-type belt conveyor which is available mounted on portable trestles, complete installations being suitable for use where periodic rearrangements may be necessary in order to suit altered flowline requirements.

Mobile conveyors and similar machines made by Manufacturers Equipment Co., Ltd., are listed in Table 1, and briefly described in the review which follows.

For Extra-heavy Duties

The heaviest mobile conveyor made by Manufacturers Equipment Co., Ltd., is their Rapistan Rapid Power Booster. This is ideal for bags, cartons, crates, boxes and other types of packaged materials. It is designed for the loading and off-loading of road vehicles and railway wagons, for stacking purposes, for moving goods to and from balcony bins in stores and warehouses, and is particularly suitable for use as a booster in a gravity conveyor line.

The Rapistan Power Booster is a reversible variable-delivery-height machine and is shown at work in Figs. 1 and 2. Essential features are illustrated in Figs. 3, 4, 5 and 6. It is mounted on four swivel castors with 6-in steel wheels, which permit one-man manœuvring of the machine through narrow gangways and along crowded work areas. Discharge height adjustment and angle of inclination are controlled by

Fig. 1. *Rapistan Rapid Power Booster extra-heavy-duty mobile conveyor loading a railway wagon with cartons overseas*

Fig. 2. *Rapistan Rapid Power Booster extra-heavy-duty mobile conveyor mounted on sub-base which adds* 18 *in or* 30 *in to its overall height, depending upon adjustment. The conveyor is here seen elevating large bales of insulation wool from railway wagon to storage level*

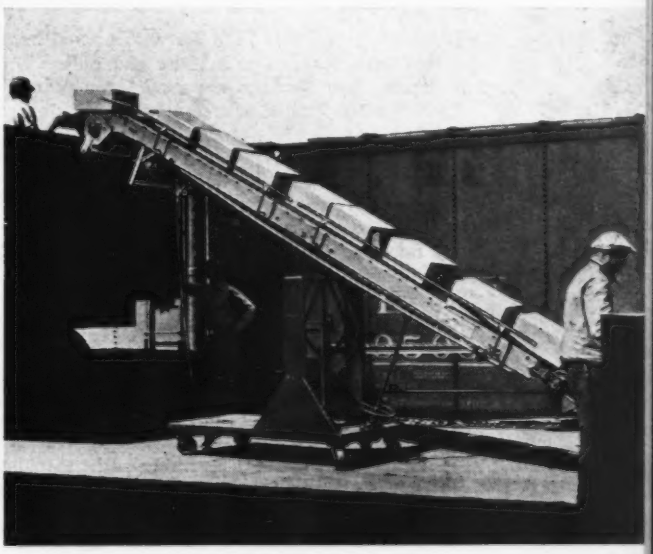


Table 1.—Rapistan Mobile Conveyors and Similar Equipment

Applications	Machine
Extra-heavy-duty handling of unit loads and boosting of gravity flowlines	Rapid Power Booster (Rapistan model 600)
Heavy-duty handling of unit loads and boosting of gravity flowlines	Stevedore Junior (Rapistan model F.300)
Light-duty handling of unit loads and boosting of gravity flowlines	Economy (Rapistan model F.300 light-duty version)
Light-duty handling of unit loads and rapid manœuvring from point to point by one man only	Aluminium Stevedore Junior (Rapistan model F.350 extra lightweight)

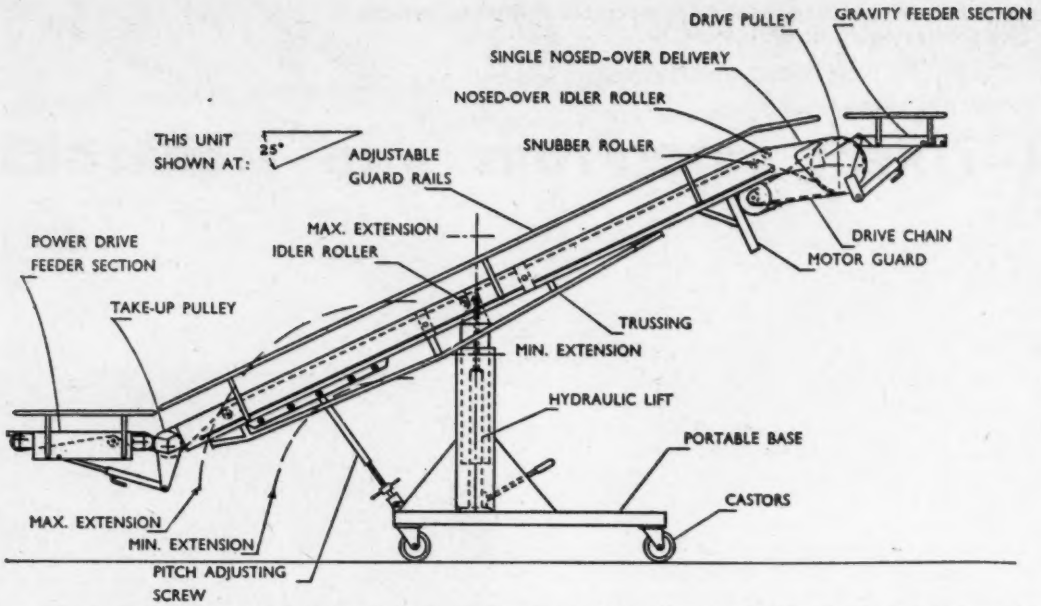


Fig. 3. Layout of Rapistan Rapid Power Booster mobile conveyor

means of manually-operated hydraulic and mechanical systems. The frame of the conveyor may be bodily raised or lowered 2 ft 2 in by manual-hydraulic jacking; conveyor inclination may be precisely adjusted by means of a hand-operated pitch adjusting screw, maximum inclination being 30 deg to the horizontal.

The conveyor is available in a range of sizes and with a variety of optional beltings. Normally, a 3-oz, 28-ply canvas duck belting is used, having a rough-top rubber cover, which is suitable for horizontal working and for certain types of inclined working. Cleated belts are also available, as well as a number of other belt materials and specifications, according to application, or specific requirements. Conveyor belts are in three optional widths: 12 in, 16 in and 20 in. In each case the conveyor frame is $10\frac{1}{2}$ in wider than the belt. Conveyor length, between centres, is 10 ft, 12 ft 6 in, or 15 ft for belts without cleats. Cleated belt conveyors are somewhat longer, 12 ft 6 in, 16 ft, or 20 ft. A nosed-over delivery section may be fitted. This is designed to provide a smoother transfer of cases from the horizontal to the inclined plane of the conveyor, or vice versa, and is illustrated in Fig. 4. It increases overall conveyor length by 12 in only.

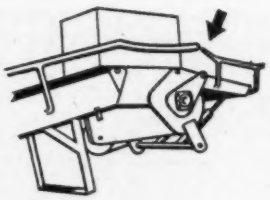


Fig. 4. Nosed-over delivery section of the Rapistan Rapid Power Booster mobile conveyor, for smooth transfer of cases from the belt to the horizontal delivery section, or vice versa

The driving pulley is 12 in dia and secured by two keys and four set-screws. The take-up end pulley is 6 in dia. Self-aligning ball bearings are used throughout.

The conveyor bed is of steel-box channel construction, 10 and 12 gauge, reinforced by means of 1-in welded tubular trussing. Two types are available: wheel or slider beds (Fig. 5). Choice, between these alternatives, depends upon the nature of the load to be handled and the type of electric motor employed. As a point of interest, it may be stated that the use of a wheel-type conveyor bed increases conveyor capacity because of reduced belt drag.

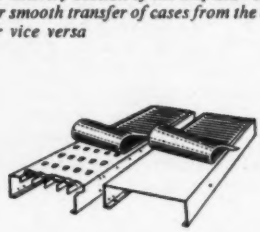


Fig. 5. Alternative beds are optional with Rapistan mobile conveyors, wheel bed or slider bed. The former reduces belt drag and increases conveyor capacity

An adjustable self-supported gravity-wheel-type feeder section is fitted to the drive or delivery end (top end) of the machine. A feeder section can also be fitted to the lower or feed end of the machine. In this case it is an optional extra. Two types are available, a gravity wheel feeder section, or a power-driven section. The latter type is self-supported and driven by a fully-enclosed roller chain from a sprocket on the take-up pulley in the main frame of the machine.

Belt tension is regulated by means of a screw-type adjustment and there are belt tracking adjustment plates at both sides of the conveyor for positive belt alignment.

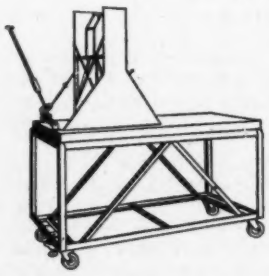


Fig. 6. Sub-base of Rapistan Rapid Power Booster mobile conveyor, which adds 18 in or 30 in to overall height. It is mounted on swivel castors and robustly constructed

The conveyor is reversible and can be fully controlled from either end, or through a remote-controlled switch located wherever convenient. Normally it is mounted on a heavy 3-in channel fabricated steel base, as shown in Fig. 1. Alternatively, a sub-base may be fitted, as shown in Figs. 2 and 6. The sub-base increases the overall height of the machine by either 18 in or 30 in, and is particularly valuable for reaching high storage bins and for inter-floor handling.

The conveyor belt runs at 50 ft/min on standard machines. Conveyors can, however, be provided with faster or slower belt speeds, as specified. The size of electric driving motor, too, can be varied between $\frac{3}{4}$ h.p. and 2 h.p., according to user requirements, loads to be handled and corresponding angles of elevation. One version of the Rapistan Rapid Power Booster mobile conveyor, for example, has a lift of 8 ft.

For General-purpose Duties

The second heaviest mobile conveyor made by Manufacturers Equipment Co., Ltd., is their Rapistan model F.300 Stevedore Junior machine, which is shown at work in Figs. 7, 8 and 9. This model is a reversible belt conveyor with variable discharge height and variable delivery height. It is mounted on a toggle stand and is suitable for stacking and for vehicle loading and off-loading, rail truck loading and off-loading and the movement of materials to balcony bins, as well as for booster duties in gravity flowline arrangements. The general arrangement is shown in Fig. 10, and leading dimensions are given in Table 2. Other versions of model F.300 are described elsewhere below.

The Rapistan Stevedore Junior mobile conveyor will handle cartons, kegs, bags, boxes and rolls of material. It can be moved from point to point by one man, and powered from the nearest electric power outlet. Maximum inclination is 45 deg, and the conveyor inclination is locked in any position by means of a self-locking crank mechanism.

Standard machines have rough-top rubber and canvas conveyor belts in 10 in and 16 in widths, other belts being available for special applications. Belt speed is normally 65 ft/min, but other belt speeds are also available. Normally, $\frac{1}{2}$-h.p., $\frac{3}{4}$-h.p. or 1-h.p. electric motors are fitted, depending upon load conditions, as well as 25 ft of power cable. Combined forward-stop-reverse magnetic switch controls are used and more or less instant belt reversing is obtained, overload protection being incorporated in the controls.

There are identical feeders at each end of the machine, providing automatic on-off feed when the belt is reversed, thus assuring a smooth flow of goods without breaks. These feeders can handle cartons at inclinations of up to 25 deg. They are self-supported, adjustable to 30 deg above the line of the conveyor belt, and 30 deg below, permitting the machine to operate with its driving pulley either at the elevated end of the machine or at the lower end. The feeders have grease-packed wheels at $1\frac{1}{2}$-in centres, with slider bars between wheels and hinged slider plates, as well as adjustable steel-channel guard rails.

Two other interesting features deserve special mention: a safety hinged feeder plate which 'flips up' if anything gets wedged between it and the belt, permitting removal of the object, and protecting products and operators' hands; and, a pop-out roller, which bridges the gap between the conveyor belt and the first roller or row of wheels of a gravity roller conveyor, where this is employed in connection with the Stevedore Junior Conveyor.

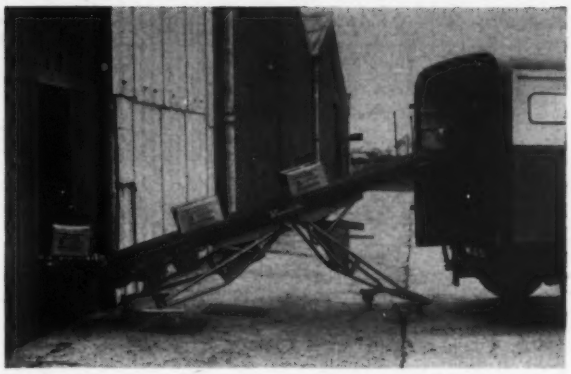


Fig. 7. Rapistan Stevedore Junior mobile conveyor loading packed Crompton Parkinson fractional motors into a van. This conveyor can handle slabs, cartons, cans, bags, rolls and flat goods, and may be used as a booster in a gravity conveyor line or as a floor-to-floor conveyor, as well as a loading conveyor

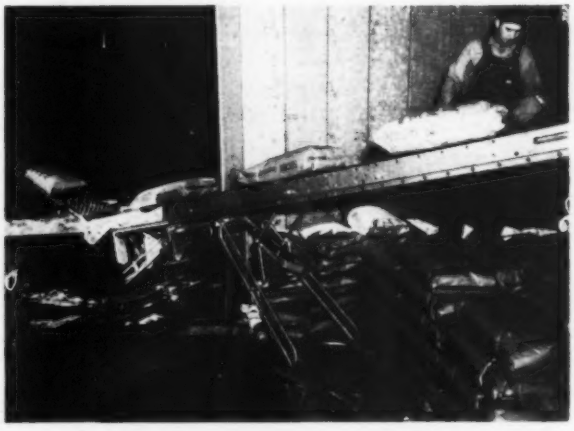


Fig. 8. Rapistan Stevedore Junior mobile conveyor handling bags of calcium chloride into store from a railway wagon, via a gravity wheel conveyor

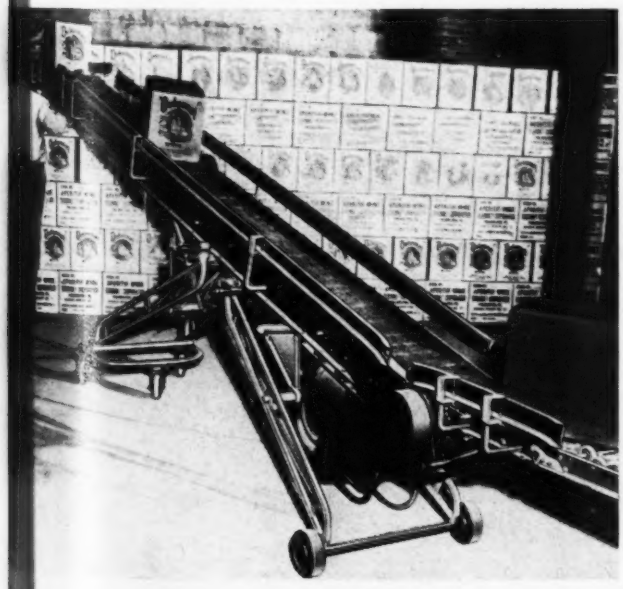


Fig. 9. This photograph illustrates the ease of stacking obtained with a Rapistan Stevedore Junior mobile conveyor. The inclination is quickly altered to suit stack height

Table 2 LEADING DIMENSIONS OF RAPISTAN STEVEDORE JUNIOR MOBILE CONVEYOR

Length		Max at Take-up Min at Drive	Max Both Ends	Min at Take-up Max at Drive	Min Both Ends	Horizontal	
						Max	Min
	a. Take-up level	88 in	73 in	12 in	22 in		
	b. Drive level	13 in	56 in	74 in	21 in	61½ in	22 in
10 ft.	c. Overall length	12 ft 8 in	14 ft 7 in	13 ft 6 in	14 ft 8 in	14 ft 8 in	14 ft 8 in
	d. Pitch	34 deg	7 deg	−27 deg	½ deg	0 deg	0 deg
	e. Overhand at T.U.	21 in	53 in	27½ in	25 in		25 in
	a. Take-up level	104½ in	7 in	−1½ in	22½ in		
	b. Drive level	13 in	56 in	74 in	21 in	61½ in	22 in
12½ ft	c. Overall length	14 ft 9 in	17 ft 1 in	15 ft 9 in	17 ft 2 in	17 ft 2 in	17 ft 2 in
	d. Pitch	34 deg	7 deg	−27 deg	½ deg	0 deg	0 deg
	e. Overhand at T.U.	46 in	83 in	54½ in	57 in		57 in
	a. Take-up level	105 in	74½ in	2½ in	22½ in		
	b. Drive level	14 ft 0 in	57½ in	73 in	21 in	61½ in	22 in
15 ft	c. Overall length	17 ft 9 in	19 ft 7 in	18 ft 6 in	19 ft 8 in	19 ft 8 in	19 ft 8 in
	d. Pitch	28 deg	5 deg	−22½ deg	½ deg	0 deg	0 deg
	e. Overhand at T.U.	66 in	97 in	66½ in	67½ in		67½ in
	a. Take-up level	80 in	69 in	17 in	22½ in		
	b. Drive level	17 in	59½ in	69 in	21 in	61½ in	22 in
17½ ft	c. Overall length	21 ft 5 in	22 ft 2 in	21 ft 0 in	22 ft 2 in	22 ft 2 in	22 ft 2 in
(*a*)	d. Pitch	16 deg	2 deg	−13 deg	½ deg	0 deg	0 deg
	e. Overhand at T.U.	43 in	58 in	27½ in	25 in		25 in
	a. Take-up level	78 in	68½ in	18 in	22½ in		
	b. Drive level	18 in	60 in	68 in	21 in	61½ in	22 in
20 ft	c. Overall length	24 ft 0 in	24 ft 8 in	24 ft 2 in	24 ft 8 in	24 ft 8 in	24 ft 8 in
(*a*)	d. Pitch	13½ deg	2 deg	−11½ deg	½ deg	0 deg	0 deg
	e. Overhand at T.U.	45½ in	59 in	26½ in	25 in	25 in	25 in

Lineal Dimensions

Bed Length	C/C Pulleys	Less Feeders Overall	With Feeders	
			C/C Connectors	End of Connectors
10 ft	11 ft 3⅜ in	12 ft 3½ in	14 ft 7⅜ in	14 ft 8½ in
12½ ft	13 ft 9⅜ in	14 ft 9½ in	17 ft 1⅜ in	17 ft 2½ in
15 ft	16 ft 3⅜ in	17 ft 3½ in	19 ft 7⅜ in	19 ft 8½ in
17½ ft	18 ft 9⅜ in	19 ft 9½ in	22 ft 1⅜ in	22 ft 2½ in
20 ft	21 ft 3⅜ in	22 ft 3½ in	24 ft 7⅜ in	24 ft 8½ in

(*a*) The 17½-ft and 20-ft models are for horizontal or inclined operation up to 16 deg and cannot be used beyond this limit.

The conveyor belt runs over a 12-gauge steel-box-section bed, either along the smooth steel itself, in the case of a slider bed machine, or along four or five lanes of wheels, in the case of a wheel bed machine. Either type is optional.

Standard machines are available with conveyor bed lengths of from 10 ft to 20 ft, in steps of 2 ft 6 in. 10-ft machines have single-unit conveyor beds. Longer conveyors have two-section conveyor beds securely bolted through a $\frac{3}{16}$-in splice plate. Extension sections can be added or removed to suit changing requirements. These are available in standard lengths of 2 ft 6 in, 5 ft, 7 ft 6 in and 10 ft. In all cases, conveyor length between centres is about 1 ft 3 in longer than frame length. Bed width is 2½ in wider than belt width.

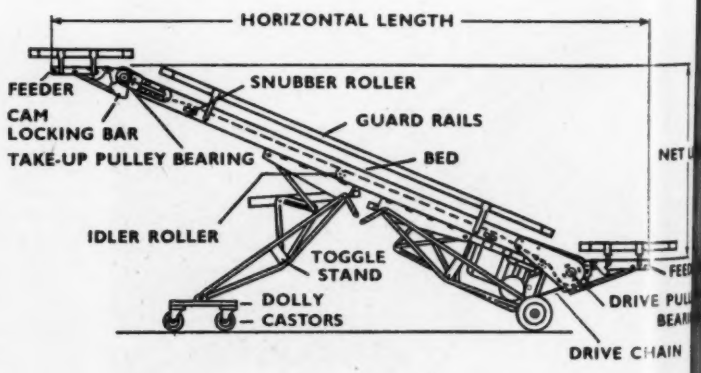


Fig. 10. *Layout of Rapistan Stevedore Junior mobile conveyor*

Welded steel pulleys are used. The driving pulley has a taper crown and is 8 in dia, the take-up pulley being 4 in dia. Both are self-aligning and have grease-packed ball bearings. Snubber rollers are located near the driving pulley. These are 2 in dia, of steel tubing, and adjustable on both sides for belt tracking. They have permanently lubricated bearings. The idler rollers are also of 2 in dia, of steel tubing, with sealed bearings, and adjustable for belt tracking. Adjustable belt guard rails are also fitted.

The conveyor is mounted on a heavy steel toggle base, consisting of twin legs, both identical, except for use of twin wheels at the driving end, and use of three swivel castors at the take-up end, mounted on a dolly. Optionally, machines may be obtained with dolly-mounted castors at both ends, in order to provide increased manœuvrability.

The unit-load capacity and the maximum distributed load of the model 300 Rapistan Stevedore Junior mobile conveyor vary according to the size of motor fitted and the required working elevation. The capacity of the conveyor bed is such as to enable unit loads in excess of 1 cwt to be handled, as well as quite high distributed loads.

For Lighter Duties

A light-duty version of the Rapistan model F.300 Stevedore Junior mobile conveyor is also available. This is specially designed for economical inter-floor movement of goods and consists of an inclined belt conveyor mounted on a two-wheeled carriage and supported by a light trestle at its discharge end, or by other suitable means. A typical example of application is shown in Fig. 11. Other popular applications include the feeding of high-level storage bins, and the raising of work in progress, or packaged goods, on to gravity flowlines.

This model is simple in design and strongly-built of steel construction. Its weight is quite low and, as can be seen from Fig. 11, a bare minimum of accessories are incorporated. Standard machines have rough-top rubber and canvas belts, and can work at inclinations of up to 40 deg, depending on the materials and items handled. Guard rails are not normally fitted but can be supplied as extra fittings. Feeders, too, are not normally supplied. These, also, are available if required. Belt width is 10 in or 16 in with bed widths of 12 in and 16 in respectively. Standard belt speed is 75 ft/min and either ½-h.p. or 1-h.p. driving motors are used. Conveyor bed lengths are from 10 to 20 ft in steps of 2 ft 6 in, centre-to-centre length being 1 ft 3 in more.

The lightweight Stevedore Junior mobile conveyor is generally fitted with a ½-h.p. electric motor. The machine has a concentrated load capacity of 375 lb, and a distributed load capacity of 370 lb at 0 deg elevation. At an elevation of 30 deg the distributed load capacity is 155 lb. These load capacities are based upon bed deflection tests on units of length 15 ft and over. On smaller units the load capacity is proportionally higher, but the makers prefer to work with the stated limits in all cases.

In practice, with this machine as with all other Rapistan mobile conveyors, the individual customer's requirement is the final deciding factor, the actual machine offered being that most suited to his purpose, and, in many cases, this implies a greater or lesser variation from standard. For example, driving motors of more than ½-h.p. capacity could be fitted to lightweight Stevedore Junior conveyors. Similarly, if absolutely necessary, a steel bed could be fitted to give a higher loading capacity, in which case the weight would be increased and the portability reduced.

Where Maximum Mobility is Important

On many jobs maximum mobility is of major importance and all manhandling may have to be carried out by one man unaided, or sometimes by a girl. For such applications,

Fig. 11. Loading out airbricks from kiln with the aid of a Rapistan model F.300 light-duty steel mobile conveyor

Fig. 12. Rapistan Aluminium Stevedore Junior mobile conveyor loading a van with packaged biscuits at McVitie & Price's works. This machine is highly manœuvrable and can be stored in an upright position

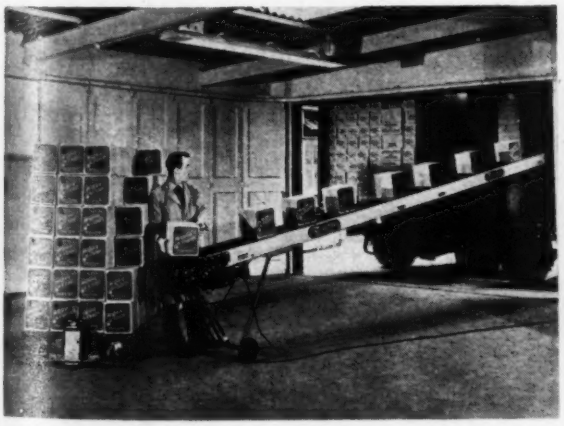
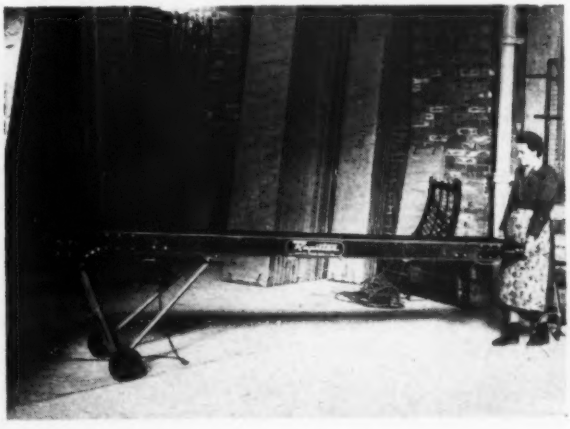
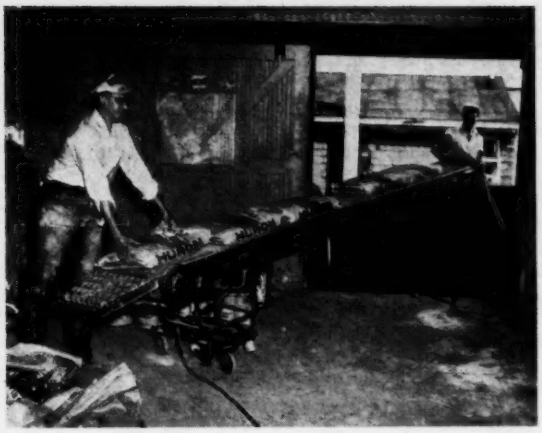
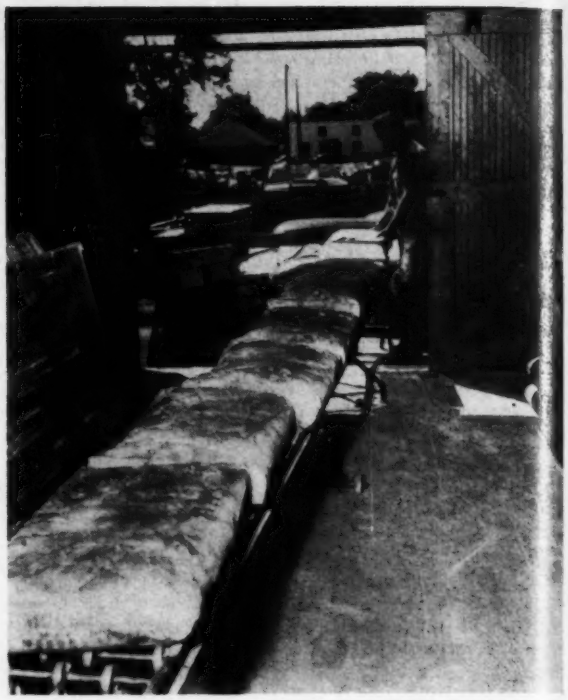


Fig. 13. Rapistan Aluminium Stevedore Junior being handled from one job to another by a girl operator







ABOVE
Fig. 14. Aluminium Stevedore Junior mobile conveyor moving bagged cement from storage to loader in lorry. In conjunction with a gravity conveyor, this machine moves supplies into and out of distant parts of the warehouse

RIGHT
Fig. 15. Use of Rapistan semi-mobile gravity conveyor to handle bagged cement at convenient working height, from warehouse to stacker in lorry

Manufacturers Equipment Co., Ltd., have designed an ultra-lightweight version of their Stevedore Junior mobile conveyor. This is of aluminium alloy and is suitable for loading and off-loading duties, inter-process handling and stacking. It is illustrated in Figs. 12 and 13, and is available in lengths ranging from 5 to 20 ft in steps of 2 ft 6 in.

Case Study Experience

Rapistan mobile conveyors originate in the U.S.A., where they are manufactured by The Rapids-Standards Co., Inc. U.S.A. case study experience with Rapistan conveyors has been made available to the Manufacturers Equipment Co., Ltd., who make these machines in Britain, and reinforces the mobile conveyor 'know how' of mechanical handling engineers employed by the firm in the United Kingdom. These engineers are available for examination of customers' handling problems and for consultation regarding possible solutions. Often, similar problems in Britain or America have already been encountered and overcome, in which case users or potential users of Rapistan conveyors are given details of relevant case studies, these being available in the form of field reports.

Typical Rapistan field reports of American origin are briefly reviewed in what follows. These are of some interest because, although some years old in most cases, many of them deal with mechanization of building materials stockists. And, as is well known, in this field mechanization in Britain is—with rare exceptions—still at a low level.

One Rapistan field report deals with a Michigan building materials firm, where hand trucking of bagged cement, plaster and other supplies was found to be inefficient in the firm's warehouse. There were three reasons for this: (*a*) the hazard and difficulty of wheeling loaded trucks along a ramp between lorries and warehouse; (*b*) breakages, 8 to 10 bags per load; (*c*) slow and laborious receiving and shipping routines and long turn-round period of lorries in the loading dock.

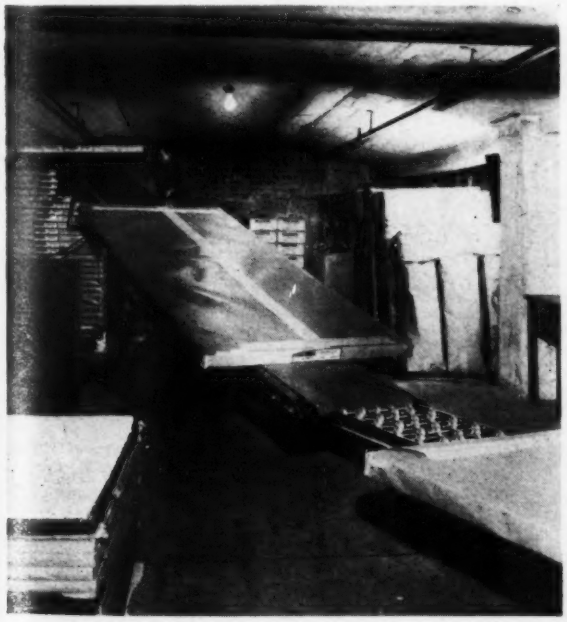
In this case a 13 ft 6-in Rapistan Aluminium Stevedore Junior mobile conveyor was installed, together with 50 ft of Rapid-Wheel gravity conveyor and a pair of curved Rapid-Wheel sections, two other Rapistan handling items. The mobile conveyor is wheeled to the warehouse door and loads lorries as shown in Fig. 14, the discharge end being supported by the vehicle end gate, conveyor loading being simplified by use of an attached skate wheel loading section. Alternatively, as shown in Fig. 15, bags of lime, cement, etc., incoming and outgoing, are handled by the Rapid-Wheel conveyor, which is semi-mobile, being carried on wheeled or lightweight flat-based supports. The level of the warehouse floor is that of the lorry body floor and the conveyor height is suitable for convenient manual loading and off-loading. In some instances, loading and off-loading is carried out by combined use of the mobile conveyor and the Rapid-Wheel conveyor, as when reaching right into the warehouse. The entire system is reversible.

As a result of installing the mobile conveyor and other handling equipment mentioned, loading operations were speeded up by 33 per cent or more and manual labour reduced in intensity. An average of 1,000 bags/day are now handled and peak output capacity is much greater. Typical examples of handling capacity with a four-man crew are 1,000 barrels of cement in 20 min and 20 tons of plaster in 1 hr, according to the field report. In addition, bag breakage and handling losses have been cut in half.

Another interesting field report also deals with building supplies. In this case it refers to methods used in various wholesale and retail supply yards. Fig. 2 was culled from this report. It shows a Rapistan Rapid Power Booster mobile conveyor elevating rolls of insulation from a railway wagon into balcony bins at a Toledo, Michigan, wholesale supply house. Fig. 11 is another example, and shows bricks being conveyed from kiln to delivery truck at a Cleveland, Ohio, supply firm. Fig. 16, shows an Aluminium Stevedore Junior mobile conveyor stacking multiwall bags

Fig. 16. ***Aluminium Stevedore Junior mobile conveyor stacking multiwall bags of cement***

of cement at Milwaukee, Wisc. Other illustrations show the use of Rapistan Rapid-Wheel conveyors for the handling of the following builders supplies: long mouldings, bundles of hardboard and building board, mixed lumber during unloading and sorting of mixed lorry loads, floor boards, etc.



ABOVE
Fig. 17. ***Rapid Power Booster mobile conveyor stacking packaged building board in basement storeroom of restricted headroom***

Fig. 17, reproduced from a third field report, shows a Rapid Power Booster mobile conveyor stacking packaged building boards in a below-ground-level store of restricted headroom, working to the full height of about 8 ft. In this case the warehouse was at Davenport, Iowa, below the level of an adjacent railway siding. Originally hand trucking and a lift were used. These handled bulky building supplies such as roofing and asbestos products, enamelled wallboard, blanket insulation, etc., amongst them 250-lb packages of insulation board and hardboard, 4 ft wide and 12 ft long. A certain amount of damage occurred in handling, and turn-round time of lorries for incoming and outgoing loads was high, e.g. four men would take 8 hr to unload a railway wagon. Furthermore, the floor trucks used were hard to handle and dangerous.

The Rapistan equipment installed, a 15-ft Rapid Power Booster mobile conveyor and 100 ft of 18-in wide Rapid-Wheel gravity conveyor, speeded handling by 50 per cent, increased safety and increased effective storage space.

Another Rapistan field report deals with the handling of bagged flaked calcium chloride at seven district warehouses of the Kent County Road Commission, Grand Rapids, Michigan, this being for laying dust and melting ice on highways. The bags are unloaded from railway wagons and stacked in store, removed as required, and emptied into conveyorized distributor lorries. Each warehouse was supplied with a Stevedore Junior mobile conveyor, an aluminium wheel gravity conveyor and curved sections, handling routines being introduced as follows.

Incoming railway wagons loaded with calcium chloride are, in turn, aligned with a gravity conveyor which reaches right inside, and discharges on to the Stevedore Junior mobile belt conveyor, which elevates the bags sufficiently

BELOW
Fig. 18. ***Elevating bags of calcium chloride by Stevedore Junior mobile conveyor. This discharges on to a gravity conveyor which runs the full length of the distributor lorry to the left, and includes a movable knife section for bag-slitting***

for stacking in the warehouse. Outgoing deliveries from the warehouse are handled by conveyor to the opposite end of the building, bags being elevated into bulk distributor lorries. Each bag is automatically slit by passing over a removable mower-type cutting knife located at the gravity discharge conveyor, which is fed by a Stevedore Junior mobile conveyor. The general arrangement is as shown in Fig. 18. The slit bags are lifted and emptied by two men, one on either side of the conveyor. The discharge conveyor section runs along the full length of the distributor hopper. Loading commences at the front end and moves back to the rear, the knife section being moved along the gravity conveyor as loading proceeds. After completion of loading, the gravity conveyor section is removed and the lorry drives off, one-man spreading being carried out in the usual way. This lorry loading system enables a 5-ton vehicle to be loaded in 5 min. Other advantages obtained include: use of a smaller warehousing and lorry loading crew, reduced handling costs and faster service to the public.

Finally, one might find interesting food for thought in yet another Rapistan field report, in this instance one dealing with the handling of bananas from ship to shore. Originally, a 50-man crew was used. This was cut to 25 men and handling capacity doubled, i.e. a fourfold increase in productivity. In addition, heavy lifting was reduced. Other advantages achieved were as follows: 50 per cent cut in inspection time, improved ability to maintain quality of fruit due to faster handling and improved safety conditions due to elimination of congestion at the dockside. At the time of the report, something like £70 per week was being saved.

The improvement was obtained by making use of four wheel-mounted 20-ft Floor-Veyor conveyors, running from ship to shore, and five 30-ft castor-mounted Floor-Veyor conveyors on the dockside, these being for lorry loading and handling of ripe bananas to the cutting table. (Floor-Veyor conveyors are another of the types of conveyor made by Manufacturers Equipment Co., Ltd.) In addition, a Rapid-Wheel gravity conveyor is used to handle sorted and boxed ripe bananas from cutting table to loading area.

Other Rapistan Handling Equipment

Other mobile and semi-mobile handling equipment made by Manufacturers Equipment Co., Ltd., includes the following: Rapistan gravity roller conveyors and gravity (skate) wheel conveyors, available in straights and curves, with quick-action connections, hinged sections, lightweight adjustable-height stands, and mobile stands mounted on wheels or castors; Floor-Veyor medium-duty and heavy-duty belt conveyors. Heavy-duty fixed conveyors are also made.

NEWS OF PERSONALITIES

R. G. Camp

C. A. Remfrey

R. G. Camp has been appointed sales manager of Square D., Ltd.; he operates from the company's new headquarters at Cheney Manor, Swindon. The appointment follows his promotion earlier this year from area manager to headquarters sales manager.

Douglas H. Outwin has joined Materials Handling Equipment (Great Britain), Ltd., as sales manager. An electrical engineer by training, Mr. Outwin has been associated with The Yale & Towne Manufacturing Co. since 1946, and general sales manager of their British materials handling division for the past five years.

Charles A. Remfrey has been elected the new national chairman of the Institute of Materials Handling. He first became interested in materials handling in 1942, when he established what is now the Materials Handling Division of Fisher & Ludlow, Ltd., with extensive interests in all forms of materials handling equipment, at home and throughout the world. He is a founder member of the Institute of Materials Handling and a Trustee of the Institute.

E. R. Johnson has been appointed design engineer with Vac-U-Lift (Great Britain), Ltd. Mr. Johnson graduated from the Royal College of Science and Technology in Glasgow with a B.Sc.(Hons.) degree, after which he became a Graduate Member of the Institute of Mechanical Engineers.

John Hall has recently been appointed sales engineer, in the South Wales area, for Priestman Bros., Ltd. Mr. Hall works in close liaison with **Mr. H. McGeown**, service engineer in that area, and is available at all times to discuss matters regarding grabs, excavators and grab dredging equipment. He is resident in Cardiff at 62 Coryton Rise, Whitchurch.

E. R. Johnson

John Hall

Bowmaker (Plant), Ltd., announce the following appointments to their staff:—

W. J. Lloyd has been appointed South Wales area manager, based at their Cardiff depot. He was formerly sales supervisor with R. Cripps & Co., Ltd., Nottingham.

Dennis M. Beddows has been appointed sales promotion manager. He will handle all sales promotion, advertising and general publicity.

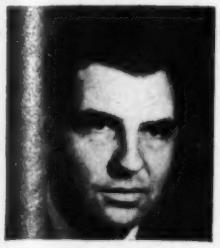
F. J. Butler has become used equipment manager, after

W. J. Lloyd

D. M. Beddows

K. Allison

C. McInnes



R. P. Lister

G. K. Coldwell

completing his duties with the Bowmaker Training Scheme. Mr. Butler will operate from Willenhall depot, co-ordinating the buying and selling of used and second-hand equipment.

Jack **Cooper** has moved from his territory in the West Country, and has taken over the south-west area, comprising Devon, Cornwall, Somerset, Dorset and parts of Hampshire and Wiltshire.

Elliott Brothers (London), Ltd. (a subsidiary of Elliott-Automation), announce the following appointments:—

L. **Bagrit**, chairman and chief executive, **Dr. L. L. Ross,** managing director, **E. O. Herzfeld,** deputy managing director and controller, and **G. C. Fairbanks** and **Cmdr. H. Pasley-Tyler, R.N. (Retd.),** have been appointed assistant managing directors. **L. C. Upsdell** is now a director and secretary of the company.

John King & Co. (Leeds), Ltd., have announced three new appointments: **J. H. King** has been elected to the board; **H. Johnson,** secretary, and **H. R. Knapp,** commercial manager, who have both had long service with the company, have been appointed associate directors.

G. K. **Coldwell** has been appointed a director of Belling & Co., Ltd. Mr. Coldwell joined the company in 1953 as production engineer and was appointed deputy works manager in 1958.

Dennis Wright has been appointed sales manager (tractors) for Road Machines (Sales), Ltd., who have been appointed industrial distributors for the J. I. Case Co. Mr. Wright is leaving H. Leverton & Co. to take up his new post, and will be based at the West Drayton headquarters of Road Machines.

R. **Patrick Lister** has been appointed home sales director to Coventry Climax Engines, Ltd. In this position, Mr. Lister will become responsible for the sales of all Coventry Climax products. He was appointed a director of the company in 1956.

Keith Allison, a member of the conveyor and belting section of the Goodyear Industrial Rubber Products Development Department for the past three years, has been appointed industrial rubber products sales manager for the Goodyear Tyre & Rubber Company of India Private, Ltd., at Calcutta.

W. L. Simpson, formerly of Sherpa Trucks, has been appointed sales manager to E. Stephens & Son, Ltd., pallet and stillage manufacturers.

Colin McInnes has been appointed chief project engineer in the newly formed Solids Handling Pump Division of Mackay Industrial Equipment, Ltd.

T. Furness, secretary and a director of Thomas Robinson & Son, Ltd., the Rochdale engineering company, has been appointed a joint managing director of the company. Mr. Furness was appointed secretary in 1951 and a director in 1954.

T. Furness

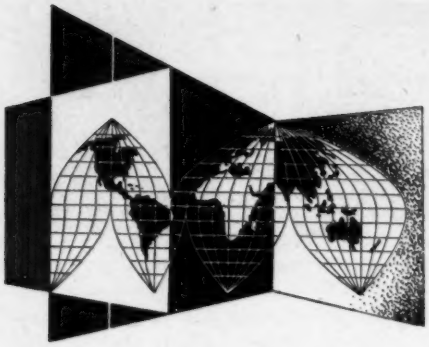
Geo. Salter & Co., Ltd., have announced that **G. Rushton** has been appointed sales manager for all products of the engineering divisions. Mr. Salter until recently was sales manager for retainers, fasteners and roller bearings; his responsibilities now include springs and castings.

W. A. Whitehouse has been appointed sales controller (engineering divisions); he was formerly Midlands area manager. A new representative, **J. M. Hipkins,** is to take over the Birmingham, Warwick and Oxford areas.

Geo. Salter has appointed **W. M. Stewart** as technical manager for engineering products in the Border counties and Scotland.

OBITUARY

The death at the age of 64 has been announced of **Edgar Arthur Lewis,** who for many years was superintendent of the India and Millwall Docks, Port of London Authority, and latterly port consultant to Production-Engineering, Ltd. After his retirement from the P.L.A. in 1955, Mr. Lewis served the International Cargo Handling Co-ordination Association as their honorary port consultant and chairman of their technical committee. In 1957 he undertook on behalf of the United Nations Technical Aid a survey of port conditions in Colombo, making recommendations for the improvement of ship turn-round. On return to England he resumed work for I.C.H.C.A. until his appointment as port consultant to Production-Engineering, Ltd.

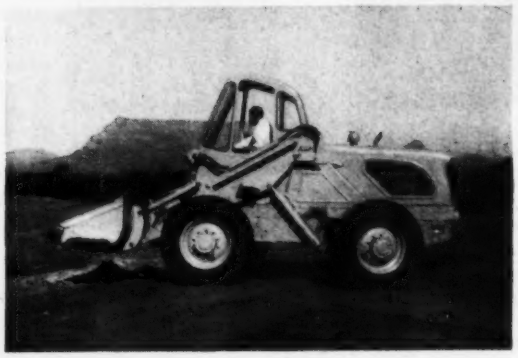


BRITISH MECHANICAL HANDLING EQUIPMENT OVERSEAS

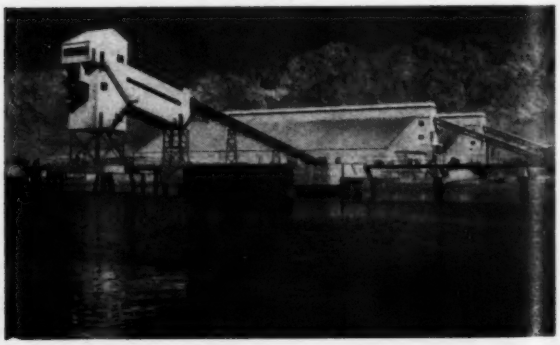
Britische Förder- und Hebegeräte befinden sich in den meisten Ländern der Erde im Einsatz. Seit Kriegsende steigern sich die Verkaufsziffern an ausländische Abnehmer von Jahr zu Jahr. Ein so grosses Ansehen geniessen Geräte britischer Herstellung, dass ausländische Käufer anlässlich der alle zwei Jahre von dieser Zeitschrift in London veranstalteten förder- und hebetechnischen Ausstellungen in Strömen herbeikommen.

In dieser monatlich fortgesetzten Artikelserie werden wir kurzgefasste Einzelheiten und Abbildungen britischer Geräte bringen, welche für das Ausland konstruiert bzw. dort bereits im Einsatz sind.

Ausländische Leser, welche an Auskünften über britische Förder- und Hebegeräte gleichwelcher Art, bzw. an Namen und Adressen der entsprechenden Hersteller, Agenten und Vertreter in irgend einem gegebenen Lande interessiert sind, werden gebeten, sich schriftlich an die Redaktion zu wenden.



SOUTH AFRICA (ABOVE)
The first Bray loader in South Africa powered by a Perkins P6(I) diesel engine and fitted with a Brockhouse torque converter. The machine, seen with South Africa's famous Table Mountain in the background, recently gave a demonstration for the Cape Provincial Administration



PHILIPPINES (ABOVE)
Republic Flour Mills Incorporated, the first flour mill in the Philippines. The million-dollar contract for this project was placed with Thomas Robinson & Son, Ltd., Rochdale, and the company has just received a repeat order for extensions worth over three-quarter million dollars

JORDAN (RIGHT CENTRE)
A phosphate and potash handling plant at the port of Aqaba in the Kingdom of Jordan, soon to be commissioned, and equipped by Simon Handling Engineers, Ltd.

Le matérial britannique de manutention mécanique se trouve en service dans la plupart des pays du monde. Chaque année, depuis la fin de la guerre, le chiffre des ventes à la clientèle des pays d'outremer s'est accru. Des acheteurs venus de tous les pays du monde accourent aux Expositions de la Manutention Mécanique (organisées par notre publication), qui ont lieu tous les deux ans à Londres, si haute est l'estime que l'on a pour le matériel de fabrication anglaise.

Dans cet article, à suivre tous le mois, nous vous présenterons les détails succincts et des illustrations du matériel anglais spécialement étudié pour et mis en service dans les pays étrangers.

Nous invitons cordialement les lecteurs de l'étranger à écrire à notre Rédacteur en Chef (The Editor) pous tous renseigements concernant un type quelconque de matériel anglais de manutention mécanique, ou les noms de fabricants, agents distributeurs ou représentants dans un pays donné.

En la mayoría de os países del mundo puede hallarse funcionando equipo británico de manejo mecánico. Desde que terminó la guerra la venta de tal equipo a los compradores de ultramar ha venido aumentando sin cesar. Tan considerable es la estima enue qse el equipo de fabricacion britanica en todo el mundo, que son numerosísimos los compradores extranjeros que se personan en Londres para visitar la Exposición de Manejo Mecánico (organizada por esta Revista) que se celebra cada dos años.

En esta sección, que aparecará todos los meses, les ofreceremos ligeros detalle- e illustraciones de tal equipo británico diseñado para países extranjeros o funs cionando en ellos.

Los lectores de ultramar que requiran información sobre cualquier equipo británico de manejo mecánico, o el nombre del agente o representante de los fabricantes en cualquier país en particular pueden escribir pidiéndola al Director de esta Revista.

NIGERIA

A pipe-handling tractor for oilfield use in the Niger Delta. Ordered by Shell International Petroleum Co., Ltd., Purchasing Division, from Michigan (Great Britain), Ltd., for the Shell-B.P. Petroleum Development Co. of Nigeria, Ltd., the machine, known as the 'Michigan' 175A pipe handler, will be used to speed up operations in the materials yard at pipeline construction jobs and drilling locations. It is designed to lift a load of 14,000 lb of tubulars in lengths up to 40 ft and travel with them as required. Since it will load and unload a 50,000-lb pipe-carrying trailer and tow it at speeds up to 27 m.p.h.—according to the terrain—considerable saving of conventional transport and handling equipment will be achieved

DENMARK

This international BTD-20 Bullgrader, powered by a 124-b.h.p. engine, was ordered by Danish contractor, Sören Pedersen of Brande. It will level the vast hilly waterlands which have been excavated to obtain the valuable lignite deposits, which play an important part in Denmark's national economy. Equipment used to unload this mechanical giant was Copenhagen Port Authority's big floating crane

British mechanical handling equipment is to be found working in most countries of the world. Each year since the end of the war, sales to overseas customers have increased. Buyers from overseas flock to the Mechanical Handling Exhibitions (organized by this journal) held every two years in London, so great is the regard for British-made equipment.

In this feature, to be continued each month, we shall bring you brief details and illustrations of such British equipment designed for, or at work in, countries abroad.

Overseas readers requiring information on any type of British mechanical handling equipment, or names of manufacturers' agents or representatives in a particular country, are invited to write to the Editor.

AUSTRIA

Merton two-way overloader loading heavy gneiss roadstone from stockpiles in quarry near Innsbruck in the Austrian Tyrol

TRINIDAD

Ransomes Sims & Jefferies FL40 fork lift truck at work at Pointe-à-Pierre, Trinidad, for Texaco Trinidad Services, Ltd.

MATERIALS HANDLING

By L. W. Bailey, F.R.ECON.S., A.M.I.PROD.E.*

I WAS very pleased indeed to be invited by the Institute of Industrial Administration to give an address on materials handling at this course on Management Practice† because there should be a greater awareness than there is at management level of its importance and its possibilities as a management tool.

Far too many managements still regard materials handling as a technical issue divorced from production organization, but in my opinion this is quite the wrong approach in most instances and I hope that at the end of my lecture you will share my view.

There are, certainly, technical aspects involved but generally they are subordinate to the organizational aspects and like many other technical matters, relatively easily solved by the appropriate technical experts, once properly defined.

There are certain exceptions to this but they occur principally in the field of heavy bulk handling such as, for example, in power stations, mines and quarries and the like.

Definitions

Here I must make clear to you the kind of materials handling operations to which my remarks refer because it would obviously be impossible for me to cover in the course of one lecture the whole vast field over which we might range, even if I were competent to do so.

In this lecture, therefore, I will be dealing with the kind of problem commonly found in commodity manufacturing establishments, for example, in the manufacture of motor cars, furniture, washing machines, electrical equipment and apparatus and the like. The problems surrounding the organization of production in such establishments have much in common whatever the end product might be.

In addition to defining the kind of handling operations with which I am dealing I want to define exactly what I mean when I speak of materials handling and to draw your attention to the important difference between materials handling and mechanical handling.

Materials handling may be defined as:—'The science of rationalizing all handling and movement of materials'. Mechanical handling is:—'One of the means whereby a materials handling problem may be solved'.

Considering these definitions as they stand it is obvious, or rather it should be obvious, that one considers the mechanical handling methods that may be employed only after exploring all possible means of rationalizing the handling involved.

Failure to appreciate the significance of these differences may lead to expensive mistakes and, in some instances personally known to me, to the introduction of expensive mechanical equipment in an effort to solve problems that could, more simply and more economically, have been eliminated entirely by changes in plant layout, process sequence revision, or similar means.

On the other hand, a proper appreciation of the wider implications of materials handling can engender an entirely new approach to the whole problem of production organization.

It may lead, for example, to a recognition of the fact that what occurs between processes may be almost as important, from the point of view of the overall efficiency of the organization, as the processes themselves.

The Materials Flow

Now let us look at what happens in a typical engineering factory during the production time cycle of the product, and in doing so let us assume that it is a well managed factory employing all the currently accepted best practices.

First the materials are received at the receiving dock of the factory, located preferably at one end of the plant and adjacent to the raw materials store. These materials are off-loaded from the lorries or trucks, if the factory has its own rail siding, and moved into the goods inward inspection area. Here the materials will be checked and tested for quality and if this involves any laboratory tests they may have to be held in quarantine for quite some time.

On release the materials next pass into the custody of the stores where they will be checked for quantity and distributed to various racks, bins, stacking points, etc., according to what is most appropriate. There may be, and usually is, some delay in a pending storage area between the receipt of the materials and their actual transfer to the racks.

The time lag between the receipt of the materials into storage and their issue to the production departments can vary enormously between one industry and another and between one factory and another, but in many establishments the amount of money tied up in stores represents a high proportion of the working capital of the company.

In passing I would say that in view of this it is surprising that in many establishments, otherwise well organized, one finds the stores treated in a 'Cinderella' manner with insufficient space, inadequate equipment and untrained personnel.

But let us resume our considerations of the passage of the materials through the plant. The stores, besides having responsibility for the safe custody of the materials, serves also as a buffer and filtering medium between the outside suppliers and the internal manufacturing departments since most frequently the materials are supplied in bulk at irregular or intermittent intervals and are used internally in production lot quantities at more or less frequent and regular intervals.

This may not apply in the case of a factory producing on a small quantity or a 'one off' basis or in a highly organized

* L. W. Bailey & Partners, Ltd.

† A paper read at a course on management practice at Wadham College, Oxford.

flow production unit, but it is the situation that obtains in by far the greater percentage of British factories since batch production is still the most usual form of production organization.

Bearing in mind that we are discussing the production of an engineering product the likely destiny of most of the materials is to be converted into components for incorporation in an assembly, and the operations carried out in the process of changing the one into the other will depend largely upon technical considerations. In any event, before the metamorphosis is complete the materials may pass through a number of different sections of the factory and in each a number of different operations may be performed. In addition, there will have occurred inspection checks and tests and quantity counts.

The production of components usually marks the completion of the first phase of manufacture, and in many establishments, if not most, the finished parts come to rest in a component stores located somewhere near the end of the machining and processing sections. Again, one of the functions of this store, as with the raw materials store, is to act as a buffer, only this time as a buffer between the production of piece parts and their incorporation in assemblies and this may be very necessary if the assembly is organized on a flow line basis.

The next manufacturing stage is usually the building up of sub-assemblies and a very large number of different components may flow from the piece part stores to the sub-assembly sections.

The sub-assemblies themselves, when completed, may be routed direct to the final assembly bay but not infrequently does one find that there is required another storage operation. This is likely to be necessary in the case of a factory manufacturing a range of products, such as domestic appliances, or perhaps a small number of basic products to which may be added optional accessories, as in the automobile industry, or yet again, when the company produces a range of products that consist of different arrangements of basically similar sub-assembly units, a method adopted by the manufacturers of some kinds of business machines and office equipment.

The last stage in the manufacture of the product in our typical manufacturing establishment will be the final assembly and to the final assembly section there may flow parts from several directions.

From the component stores will come a variety of components to be embodied in the final assembly, sub-assemblies may come from the sub-assembly sections or stores, or perhaps from both.

Almost certainly some fabrication requiring materials from the raw materials store will occur and it may be that some components, usually the larger elements of the product, will come direct from the processing sections having been produced on a flow line basis arranged to synchronize, more or less, with assembly requirements.

In any event, components and sub-assemblies, etc., will be routed to the final assembly section there to be assembled and finally tested and inspected.

In our imaginary factory, which you will remember is a well run establishment, the packing of the product in a carton or crate will be treated as a production process and will probably be an extension of the assembly set-up. After packing the finished product will pass into the warehouse to await distribution.

Now I know there may be all sorts of variations to the procedure I have outlined according to the particular establishment involved and the product being manufactured, but by and large what I have described is what happens in a typical engineering factory manufacturing any one of the products I have instanced in the opening paragraphs of my address.

The Factors Influencing Materials Handling

Having considered the broad flow of the product through the plant, from the receipt of the raw materials to the warehousing of the finished article, I should now like to discuss some of the other factors that can influence the materials handling situation, and I think this can best be done by outlining to you the stages in a typical investigation such as my company might undertake.

If you examine the movement of materials within almost any manufacturing establishment, you will discover that the handling problems associated with it may be subdivided into three broad categories:—(1) Those associated with the general flow of materials throughout the plant; (2) Those related to the movement of materials within individual departments; (3) Those concerned with specific operations or processes.

For the purposes of this paper we may consider these different categories separately, but I must emphasize the fact that when studying the possibility of introducing improved materials handling methods it is of paramount importance that we seek the means to achieve the proper integration of the handling methods at every stage.

The first factor influencing the handling and movements of materials in the first two categories I have mentioned is the arrangement of the plant layout and, in my experience as a consultant, I cannot recall any occasion when we have found it possible to introduce any significant improvement in handling methods without first improving the layout of the plant.

One of the first principles of good handling practice is to reduce all movement to a minimum if it cannot be eliminated entirely, and you may be surprised how much can be done in this connection through improved layout techniques.

So we go back to a stage from the actual movement of materials to the layout of the plant and consider the factors influencing its design.

The first and most important thing of course is the nature of the product itself and we shall have to consider all the various processes that enter into its manufacture. We should discuss with those responsible for the technical aspects of production the need, the order, and the combination of the various operations and we shall question the logic of the assembly sub-divisions.

In this manner we shall gradually build up a technical picture of the product which will enable us, in consultation with those concerned with its production, to ascertain the possibility of revising or combining the processes to facilitate handling.

During this time we shall have acquired, or we shall have prepared, an accurate plan of the existing plant layout and the buildings within the confines of which any alterations will have to take place.

Next we shall need to know the volume and rate of production of the product, or products, if more than one is involved, and the production time cycle and frequency of the component batches if batch production is the order of the day.

In other words, we shall have to question all the various aspects of production, planning, and control, and here, of course, we find ourselves going right through to the Sales Manager, since a sales budget is the essential basis of any efficient production planning and control procedure.

We should want to know how production is scheduled in the shops, whether the basis of accurate machine loading is based upon time study or on rate fixing, or whether the whole thing is done by guess and by God—and believe me the latter method is the one most frequently employed.

Having gone as far as possible on the production planning and control side of the organization, we shall next turn our attention to the supplies division and become acquainted

with the methods of requisitioning and purchasing materials and with stores and stock records.

We shall, naturally, acquaint ourselves with the paper work involved in all these various techniques.

There are a number of subsidiary aspects of production organization that we shall examine, but for the sake of brevity these are omitted though I may refer to them in passing during the course of my paper. Those techniques that I have mentioned will be the principal ones with which we should concern ourselves.

I said earlier in my address that the implications of materials handling survey are wider than may at first seem apparent. Indeed, the whole purpose of my address is to bring this home more clearly to you, and you will notice that already in this fact-finding stage we have become involved in matters seemingly far removed from the point at which materials are actually handled.

Here I must make it quite clear that the foregoing described a fact-finding expedition, the sole purpose of which is to examine their influence on the handling and movement of materials.

It would frequently be easy to criticize the effectiveness of the techniques used or conversely, to become enamoured with their beauty, but we have always to remember that we are concerned with them only in so far as they have a bearing on the main purpose of the investigation, that is, the development of efficient materials handling methods or the improvement of those already in existence.

Organizational Faults

Let us now go back again to the imaginary factory that I talked about earlier and once more trace the movement of the product through the plant, but this time let us imagine that it is a poorly organized establishment so that I might indicate to you some of the commonly occurring handling faults arising out of organizational deficiencies.

Well, first the material arrives at the factory and commonly it arrives packed, crated, or loaded, on to lorries in a fashion not suited to the handling equipment available. Possibly nothing can be done about this but it is surprising how helpful suppliers may sometimes be when their co-operation is sought.

Indeed, if there is a considerable volume and weight of materials coming into the plant it may be necessary to sell the supplier the idea of introducing improved handling techniques into his own establishment, and many progressive organizations have gone a long way in this connection. For example, it is not uncommon for a manufacturer to provide his material suppliers with pallets on which to load materials for delivery so that they may be handled by means of fork trucks at the recipient's end.

Another example of this sort of thing is common in the tin plate industry where it is customary for the rolling mills to supply sheet material in steel strapped 2-ton bundles, but they will supply in smaller or greater quantities if this is requested by the customer. Of course, you may have to pay extra for this facility and you will have to assess its worth.

The spasmodic and unpredicted arrival of materials at the loading dock frequently causes headaches to the stores personnel. This is not just cussedness on the part of the suppliers but may be the result of the fact that the buying department has not stipulated or agreed a proper schedule of deliveries. Perhaps nobody has pointed out to them how much easier it is to organize work on the loading dock and in the stores if material deliveries can be regularly arranged so that the labour and equipment required to handle it may be laid on in advance.

Again, co-operation between the buying department and the suppliers may work wonders. After all, the supplier will be interested in getting a quicker turn-round of his vehicles.

There is no need for me to dwell upon the difficulties created in the stores by the irregular arrival of materials in packages and containers that do not lend themselves to easy handling, but one other point requires special mention.

It is not always possible immediately on receipt of the materials to move them direct to their point of storage. They will have to be checked for quantity and a certain amount of paper work is bound to be involved. The materials will, therefore, have to be set down in a pending storage area and it is difficult to organize properly such an area or to accurately determine its extent unless the volume of the incoming goods can be reasonably controlled.

The organization and layout of the stores itself and, therefore, its efficiency will be greatly influenced by the existence, or otherwise, of a recognizable buying policy on the one hand and an even rate of production on the other. Given these things there is no insurmountable difficulty in properly organizing the stores.

I know that this ideal state of affairs is not easily achieved in practice, but this should be no excuse for holding stocks of materials that are badly out of balance, one with the other, and with production requirements, nor for continuing to carry quantities of obsolete materials. Of course, the stock record figures should reveal these facts but it is surprising how quickly stocks can get out of balance unless the figures are kept continually under review.

With a properly balanced production programme which would include accurate machine loading, or at least short-period section loading, there should be no difficulty in ensuring that materials requisition arrive in the stores in sufficient time for the stores personnel to get them up and arrange delivery to the appropriate section on time.

Even if the production programme cannot be planned to the last detail somebody ought to know when a machine is going to run out and require more material. Frequently, the first indication of this is the fact that the operator reports to his foreman or chargehand that he has run out of material or that the job has finished. Even then sometimes the first indication the stores get is the materials requisition arriving marked 'urgent, machine idle'.

At this point, it is discovered that the machine has been set up to produce a component for which there is no material available in any event. Of course, the stores get blamed for all this but how frequently is it that the fault may be traced to poor organization and planning, and lack of co-ordination. The materials handling equipment available in the factory may be of the finest but it will not overcome this sort of thing.

Let us now go out into the production departments on our fault-finding tour, but since my time is rapidly evaporating let me suppose that we stand at a convenient vantage point and comment only on what we might see from there. The first thing is probably related directly to poor layout and handling methods rather than any organizational deficiency and it likely to be inadequate gangways and aisles and poor facilities for the accommodation of work awaiting processing.

Most likely we shall see materials lying or stacked directly on the floor in unsuitable containers and some of these, almost inevitably, will be obstructing the ill-defined and inadequate gangways. If we look more closely at one of the machines or workplaces we shall probably see the operator hard at work trying to make the rate for the job which is almost bound to be based on a 'floor to floor' time.

The interpretation of that impression is quite literally what it says, the unprocessed material on the floor on one side of the machine, and the processed parts on the floor on the other hand.

The fact that many piece-work rates, and even times study rates, are based on this floor to floor basis is a factor that obscures the real cost of handling in a great number of factories.

As an illustration of this point, I remember a few years ago studying the activities of a female machine operator and discovering that although she was working extremely hard she was only producing parts for about 30 per cent of the time. The rest was spent picking work up and putting it down on the floor. The machine was running all the time and according to the machine loading chart was running at 80 per cent efficiency. In fact, its utilization was only about 25 per cent of possible.

Surveying the factory at large again, we are likely to be astonished at the considerable volume of work awaiting processing on the various departments or awaiting transfer to stores or to the assembly sections. This volume of material that we see about is euphemistically called 'work in progress' though we might stalk some of it for days, weeks or even months, in some cases, and discern very little progress.

Work in progress has been aptly referred to as the 'graveyard of profits' and how frequently can an excessive volume of work in progress be traced back to faulty planning.

Despite these large volumes of work in progress dotted around the place, if we had time to take the matter up with the section supervisors or foremen they would no doubt complain bitterly that they are often kept waiting for work to be transferred to them from other sections and that they cannot get rid of completed work because the documents necessary in connection with its removal are not forthcoming.

This sort of thing is what has made necessary that sect of harassed and much maligned individuals known as 'progress chasers' whom we may see burrowing into piles of work in progress or pleading with some unfortunate foreman to have the job he's got on the machine taken off and substituted by another.

Good materials handling practice, and an efficient layout, of themselves will not cure the situation but they will make it very apparent as soon as materials, above the planned minimum, start to accrue at any point in the factory.

Let us now retire from the factory floor to the office, dispirited perhaps, but not despairing, to think all this over though on the way we might have a word with the chief inspector on the amount of scrap that is produced and the re-operation work incurred through poor handling practice and bad organization. We might also ask the personnel officer about the accident rate.

What conclusions, of particular significance to management, can we draw from our tours round the factory. The first is, I think, that the materials handling situation in the factory may be markedly affected by the activities at two levels in the establishment. The first level is the operational level, that is, on the factory floor at every stage of manufacture from raw material to finished product.

The second level is the organizational level, which includes the production planning and control section, the material and stores control departments, the supplies section, and sales department as well as such services as product and tool design.

The second conclusion we might draw is the fact that although the operational level is the one on which all the physical handling has to take place, the factors that can make or mar the effectiveness of the means employed for this purpose are factors that are primarily outside the control of the operational staff—because they have their source at the second level.

Do not get me wrong here. I am not suggesting that production supervisors and stores personnel, etc., are paragons of materials handling virtue, because it is equally true to say that however good the planning it cannot be fully effective without the co-operation of all those at the point of production. There is, however, likely to be a great difference in the approach of the individuals comprising these two levels and this difference is inherent in the very nature of their jobs.

Those at the operational level are all the time in contact with the materials themselves. Every process and each operation involves their movement—not in theory—not on paper, but physically by some means or other. Nothing can happen unless materials are moved.

The problem is there, its got to be faced and solved day by day, hour by hour and all the time. Sir Walter Puckey once observed that 'Production is material in motion' and how true that is. The organizational level, however, is usually staffed by specialists and the materials of their craft may be carried in the pocket. They are pen, pencil and paper. These specialists are unlikely to have an inherent appreciation of the problem of materials handling and the more removed they are from production the more this is likely to be the case.

Consider this organizational level for a moment as being a horizontal line on an organization chart with production planning at the centre. As we move away from the centre to buying on the one side or to sales on the other the activities appear to get more and more remote from materials handling and because of that there occurs a progressive weakening in the appreciation of its importance.

This is one of the contributory factors accounting for the 'Cinderella' stores that I referred to earlier, on the one hand, and on the other hand, well, many of us know what a hell of a task it is trying to persuade the sales boys that they don't want all the fancy shapes and sizes of cartons they've cooked up with the advertising expert. And how they love to accept rush orders for small quantities that are just off standard.

Organization and planning must precede production and because this is so it must have the seeds of good materials handling practice planted right in it. You can't successfully graft it on afterwards.

This is where top management comes into the picture because buying, production organization, and sales are matters of policy and there must be an understanding at the top level of the fact that policy is involved in materials handling. There must be at least somebody at management level with a genuine anxiety for better handling who is prepared to say 'it must be done'.

Get the organizational aspects rationalized and the problems at the shop floor level will sort themselves out, and, as I have said, they will be mainly technical in character. What is the best kind of equipment for the job and how much of it do we need.

Some of you may be thinking that I ought to have talked about mechanical handling equipment, perhaps your feeling you've been cheated a little. But what should I have talked about? Should I have spent the whole of my time talking about roller conveyor, or about the various kinds of overhead conveyors? Should I have spent an hour or so discussing the merits of the fork truck and pallet system?

Perhaps you think I might have dwelt upon the beauties of the flow line set-up, or automation, the extension of the flow line system. This might have been interesting, but despite its seemingly practicality it could only have been abstract, because to have reality discussion on such matters must be related to particular situations.

No, the aspect of the subject I chose to speak on is the one that is practical to you as managers because it has universal application.

Whatever the industry is, in which you are engaged, materials handling must enter into it. If you are convinced of the need for better materials handling and can drive home the need to organize for it, you'll find the right mechanical means. They already exist anyway.

REVIEW OF NEW EQUIPMENT

NEW FORK LIFT TRUCK

Designed for easy operation and manœuvring with good visibility for the operator, the new *Forager* 15 battery-electric fork lift truck is of 15 cwt capacity at 24 in centres and is supplied with lifting heights from the standard 9 ft 6 in to 12 ft. Lifting speed is 15-20 ft/min and mast tilt is 3 deg forward and 7½ deg backward. A heavy-duty traction motor, with current supplied from a 210 A/hr 24-V battery, drives the rear wheel through worm-reduction gear and there are three forward and three reverse speeds, giving road speeds of about 1½ to 4 m.p.h. Lifting power is provided by separate pump motor unit and control valve. The forks are 3 ft 6 in long and adjustable from 8 in to 36 in outside. The wheels are fitted with 16½ × 5-in cushion tyres and roller-bearing hubs and hydraulic brakes are applied to the front wheels by pedal and handlever. The rear wheel has a steering lock of 180 deg. Main dimensions are; overall height, raised 11 ft 3 in, lowered 6 ft 6 in for 9 ft 6 in, lift, overall width 3 ft, length less forks 6 ft, wheelbase 4 ft and ground clearance 4 in.

Easy operation and good visibility are features of the new Hirst Forager electric fork lift truck

Manufacturers are A. Hirst & Son, Ltd. Crescent Works, Meadow Lane, Dewsbury.

MOBILE CRANE

The Two-Ton Tunny tractor-drawn cross-country crane has been developed by A. J. Sheldon, managing director of Tunny Cranes, Ltd., Moreton-in-Marsh, Glos., who introduced it at the Building Plant Exhibition at Greenford. It is a hydraulic slewing crane, constructed as a platform unit, having a derricking jib and steel-wire rope hoist. It can be mounted virtually on any lorry or four-wheel-drive vehicle and yet due to its light weight keep within the required wheel loadings. With the addition of two wheels and a drawbar it can be drawn behind an agricultural or industrial tractor and has an excellent cross-country performance.

All motions are hydraulically operated. A pump supplies power to a control valve bank which controls all movements through flexible hoses. All the hydraulic cylinders have honed bores and hard chromium-plated rods with wiper seals in the glands to ensure protection from dirt. All cylinders are easily accessible for maintenance. The system is fully filtered and guarded against damage by a relief valve. Hoisting and derricking are by means of double-acting cylinders, and in case of a power failure or pressure drop an automatic safety device locks the system until a repair is made. Over-hoisting and overlowering are prevented automatically and lowering is controlled under power. Maximum hoisting speed is 60 ft/min, and derricking speed maximum to minimum, 20 sec. Slewing at 2½ r.p.m. rate, is automatically regulated through an arc of 300 deg. As the tail of the counterweight projects only 6 in beyond the side the crane can be used in very narrow passages. As a mobile crane with 16-ft jib the lifting capacity ranges from 2 tons at 6 ft 9 in radius to 12½ cwt at 15 ft 6 in radius, and with 26-ft jib from 1 ton at 8 ft radius to 5 cwt at 22 ft radius.

The normal pendulum-type safe working load indicator is fitted, but arrangements for fitting an audible and visual indicator can be made. Lubrication is confined to eight oil nipples, five of which are centralized.

The new Two-Ton Tunny tractor-drawn cross-country crane in operation

ANTI-SPILLAGE CONVEYOR BELTING

The spillage of materials off the sides of conveyor belting is prevented by the use of the Side Wall belting recently developed by Gandy, Ltd., Wheatland Works, Wallasey. It is plastic-coated and will run flat across the whole widths of the end rollers, but has edges of any desired size, which run at an up-turned angle to retain the material handled and thus avoid wastage.

BELOW
A Gandy Side Wall anti-spillage conveyor belt in operation

Designed for off-the-road operation, the new Matbro Mastiff four-wheel driven tractor-loader

FOUR-WHEEL-DRIVE TRACTOR-LOADER

Now in full-scale production by Mathew Brothers, Matbro Works, Sandy Lane North, Wallington, Surrey, the *Mastiff* four-wheel-driven tractor-loader is claimed to be the first entirely British machine of its type to be selling into the dollar market Canada, entirely on its own merits.

The *Mastiff* is a 96-h.p. 1¼-yd³ four-wheel-driven and steered, rubber-tyred tractor-loader. Standard features include a torque converter, power shift transmission, power steering and four equal-sized 14 × 24-in wheels. Because of its centre-point steering, it gives four-wheel steering and maximum traction at all times on and off the road or in congested factory conditions without 'wind up' between the axles.

GIANT TRAPEZOIDAL DITCHER

Said to be the world's largest ditcher, the Gar Wood-Buckeye 330 55-ton machine can dig trapezoidal irrigation canals in widths up to 22 ft. For its size it is remarkably versatile as it can quickly be converted to a pipeline or sewer ditcher, digging straight ditch up to 5½ ft wide and 11 ft deep. This version has operated at speeds up to 35 ft/min. It can be quickly modified to cut canals of varying widths and depths. Digging buckets on the main wheel and the rotary side cutters are changed as required. The depth of cut is controlled by the digging wheel which is hydraulically raised and lowered. It can discharge from either side of the machine or from both sides at once. This is an important feature as it allows spoil banks to be built to the required height. These banks will be compacted and later graded to form a maintenance and service road running the entire length of each main irrigation canal.

Equipped with an Allison *Torquematic* three-speed transmission and Allison torque converters, the ditcher performs with surprising smoothness, even at full digging depths and widths. It is a semi-crawler machine, providing good grade control and traction under a wide variety of digging conditions.

The concessionaire in the United Kingdom is Mackay Industrial Equipment, Ltd., Central Way, Feltham, Middlesex.

TORQUE FLOW PUMP

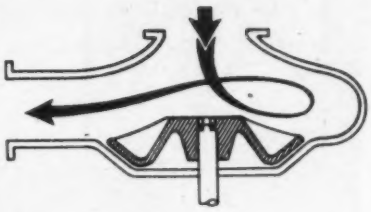
Of unusual design, the American *Wemco* torque flow pump, introduced for the first time in Great Britain by West's (Manchester), Ltd., Norton Street, Miles Platting, Manchester, 10, at the Mining Machinery Exhibition at Olympia, acts on a principle patented by the Western Machinery Co., San Francisco. It ensures the unobstructed passage of any liquid-solid combination that will pass through the ancillary piping, therefore eliminating clogging.

The pump operates by creating a vortex effect, causing pulp in the main pump body to rotate, thus developing the suction and pressure heads necessary for pumping. This action is achieved by locating the impeller out of the main flow path so that the suction and discharge waterways become one continuous open passage. The solids are, therefore, drawn into the vortex by the swirling liquid and are discharged with a centrifugal sweep from the open chamber, seldom touching the impeller, so that friable and easily damaged solids can be pumped successfully as well as highly abrasive pulps. The design, therefore, avoids damage to solids being pumped and affords protection from excessive wear to the pump parts themselves.

Among the pulp materials being efficiently handled by the *Wemco* pump are ores, coal, cement, sand, gravel, tailings and froths, coal refuse, bilge, paper pulps, rags and sewage. The pumps are available for capacities up to 2,500 gal/min and heads up to 120 ft.

INTEGRATED PORTABLE CONVEYOR SYSTEM

Understood to be the first of its kind, the new *Fulflo* feeder conveyor, introduced by the Wickham Engineering Co., Ltd., Dashwood House, Old Broad Street, London, E.C.2, represents a completely integrated portable conveyor system for handling aggregate or concrete. It combines the functions of a 1¼-yd³ temporary storage hopper and conveyor and is designed for use with the Wickham range of *Speedyfeeder* portable belt conveyors. Able to accommodate surge and intermittent loads from concrete mixers or vehicles, it will feed more than 35 yd³ of material per hour at an even rate to the 12 in-wide belt conveyors for carriage to the point of discharge. Three mixers can be positioned around the *Fulflo* to allow an almost continuous flow of concrete to the pouring area.

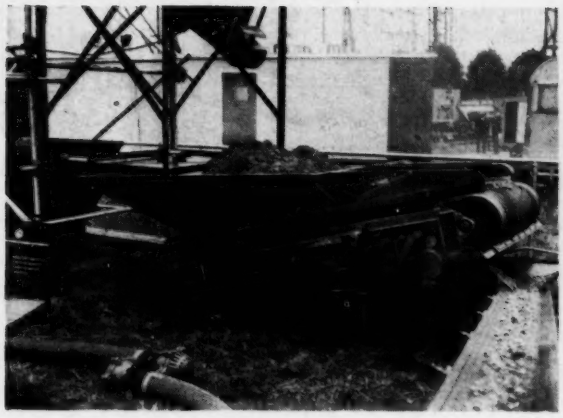


Illustrating the operating principle of the Wemco torque flow pump

The feeder consists of a 36-in-wide belt conveyor fitted with a 1¼-yd³ steel hopper and powered by a fan-cooled 2-h.p. three-phase 50-cycle electric motor. It has a belt speed of up to 100 ft/min, and an adjustable outlet controls both the capacity and width of material flow. It has 12-in dia heavy steel driving and idler drums, and 4-in steel idler rollers absorb any impact load on the belt, which is fitted with a counterweight scraper with renewable rubber blade.

Mounted on pneumatic tyres the *Fulflo* incorporates two adjustable screw jacks to remove the load from the tyres when in operation, and an adjustable drawbar for towing over rough sites. It can be supplied with either a 400-440-V motor with manual, local or remote control, or a 110-V motor with a multi-control arrange-

Trapezoidal irrigation canals in widths up to 22 ft can be excavated by this Gar Wood-Buckeye 330, 50-ton semi-crawler ditcher



The Wickham Fulflo feeder conveyor for handling aggregate or concrete

A David Brown 2D semi-industrial tractor fitted with two bolsters for carrying odd lengths of timber when the trailer is not in use

ment to allow for higher starting currents and variations in the capacities of transformers or generators. Portable remote control stations fitted with wander leads are available to enable an operator to control one *Fulflo* and up to six *Speedy-feeders* from a position where he can view both the supply and discharge points of the system. Mobile *Speedy-feeder* conveyors for use in conjunction with the *Fulflo* are available in 12 ft, 18 ft, and 24 ft nominal lengths for operation either individually or as an articulating chain.

SEMI-INDUSTRIAL TRACTOR

Developed primarily for haulage work in confined spaces, the 2D semi-industrial tractor is a new version of the David Brown 2D agricultural tractor produced by David Brown Construction Equipment, Ltd., Hanworth Park, Feltham, Middlesex. Most of the first production batch of machines have been shipped to South Africa, where they are being marketed by David Brown companies in East London, Salisbury and Benoni.

The new tractor is powered by a 14-h.p. 2-cylinder four-stroke diesel engine which is rear-mounted, air-cooled and has an average fuel consumption of ¼ gal an hour. The gearbox gives four forward speeds and reverse, with a top speed of 10·5 m.p.h. The machine has a 12-V electric starter, independent rear foot brakes and a turning radius of 7 ft 9 in. Standard wheel equipment comprises 4.00 × 15 front and 6.00 × 22 rear tyres. The normal haulage capacity is 15 tons, though much heavier loads can be handled under favourable conditions.

A full-industrial version of the 2D tractor which fully complies with the U.K. Road Traffic Acts is in an advanced stage of development.

NEW VERSION MUIR-HILL LOADERS

Increased strength, greater power and a restyled driving cab giving a high degree of driver comfort are features of the improved Muir-Hill Cardinal ¾-yd³ hydraulic front-end loader produced by E. Boydell and Co., Ltd., Old Trafford, Manchester, 16. It retains all the advantages of the original design introduced three years ago, including driver-controlled roll-back bucket action and a fully flow filtered hydraulic system.

For additional strength the main beams are constructed from pressed steel boxed channel section. Greater power is derived by fitting a Fordson Power Major 3·61-litre 4-cyl diesel engine which develops 52 b.h.p. at 1,600 r.p.m. and a maximum torque of 171 lb/ft at 1,200 r.p.m. Power is transmitted through a 13-in single dry plate clutch to a constant-mesh gearbox providing six forward and two reverse speeds. The restyled cab improves the general appearance of the machine and makes for increased driver comfort and visibility. It has a single door at the rear, sliding windows and affords complete protection against the weather.

The Muir-Hill 2-WL model loader has been specially modified to meet the requirements of gasworks in handling and loading coke and small coal. It is also fitted with the Fordson Power Major engine and a 2-yd³ bucket, the main lifting beam is increased in length by 15 in, a 40-deg roll back is provided in the bucket action and the reset rams are increased by 4 in dia.

Tests have shown that in handling coal and coke substantially higher loading rates than ever before possible are achieved. In addition, the improved

(*continued on page* 551)

The improved Muir-Hill Cardinal ¾-yd³ hydraulic front-end loader

New version of the Muir-Hill 2-WL loader specially modified for handling coke and small coal

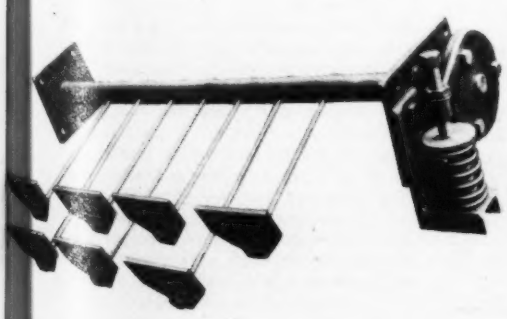
reach enables the machine to stock pile small coal up to 12 ft high. A lorry with 9 ft 10 in sides was loaded with 14 tons 6 cwt of one inch coal in 5 min 57 sec. Further tests have shown that comparable rates of loading were obtainable when the coal lay with little or no piling. The high rates are claimed to be due to a combination of the new design features and the suspension design, a safety factor with high-reach machines where any ground unevenness is encountered.

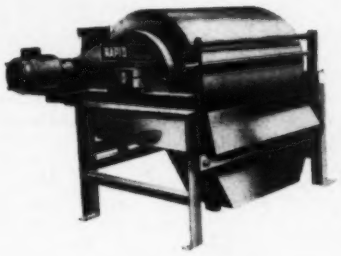
MULTI-BLADE CONVEYOR BELT SCRAPER

Claimed to offer the most effective method of conveyor belt scraping, the multi-blade scraper developed by Richard Sutcliffe, Ltd., Horbury, Wakefield, can be readily fitted to any type of belt conveyor framework and is said to have none of the disadvantages associated with the conventional counter-weighted type. Unlike the latter it reacts quickly to variations in the belt line, and the scraper edge is not subject to excessive wear in the centre where the bulk of abrasive material adheres to the belt. It is also emphasized too that there is a tendency for a single-blade scraper to become ineffective quickly due to severe wear in the centre, creating a trough through which material is able to pass. On the multi-blade device each blade is mounted on a separate spring-steel bar which allows it to wear individually according to the amount of work it does. In this way no part of the belt is left unscraped and cleaning efficiency is very much greater.

The blades are from 5 to 6 in wide, and wear-resistant rubber is bonded on to each leading face to a height of 2 in. Each blade is supported at right angles to the carrying surface of the belt by a spring-steel bar parallel to the centre line of the conveyor and carried by a cross-shaft mounted in brackets on the side frames. Initial pressure can be applied by a spring-loaded torsion bar and local pressure is maintained by the individual spring bars. Two sets of blades may be ranged across the width of the conveyor by mounting the spring-steel bars at a pitch slightly greater than the width of each blade, using alternate bars of different lengths. The belt is thus virtually scraped twice at each pass. The rubber scraping edge and steel blade wear down simultaneously, the wear rate of the rubber being far less than for scrapers with steel edges or squeegee rubber strips. The blades trail from the cross-shaft, preventing snagging by fasteners or projecting edges of torn belts. Inner and outer blades are interchangeable and simple to remove.

Showing the spring bar blade mounting and torsion bar pressure adjustment of the Sutcliffe multi-blade conveyor belt scraper





The Rapid permanent magnet drum separator

PERMANENT MAGNET DRUM SEPARATOR

Rapid Magnetic Machines, Ltd., Lombard Street, Birmingham, 12, give details of their permanent magnet wet drum separator designed to meet all requirements of the up-to-date heavy media recovery flow sheet. Elimination of the densifier demands a magnetic concentrate of at least 2·2 sp. gr. when using magnetite, and the desirability of treating the effluent from the wash screens directly without pre-thickening makes it imperative that maximum magnetic recovery be achieved even when treating very dilute slurries. The separator incorporates a slimes overflow weir and adjustable orifice rings in tailings outlet to eliminate the need for valves. Special attention has been paid to the header box which ensures proper presentation of the feed to the drum and eliminates overloading under severe surge conditions.

The 30-in drum, provided with expendable stainless-steel outer covers, and available in widths up to 72 in, is energized by a powerful multipolar *Alcomax* permanent magnet unit, eliminating all electrical wiring and accessories except those necessary for the drive motor. Single-stage recovery at 80 gal/min/ft of magnet is exceptionally high under a very wide range of feed concentrations, a typical figure quoted from an actual installation being 99·6 per cent recovery at 1·38 per cent magnetite in feed by weight. This represents a magnetite consumption of less than a tenth of a pound per ton of coal washed, based on an average of 150 gal wash water per ton of coal. A clean concentrate of 2·4 sp. gr. is produced, independent of feed concentration.

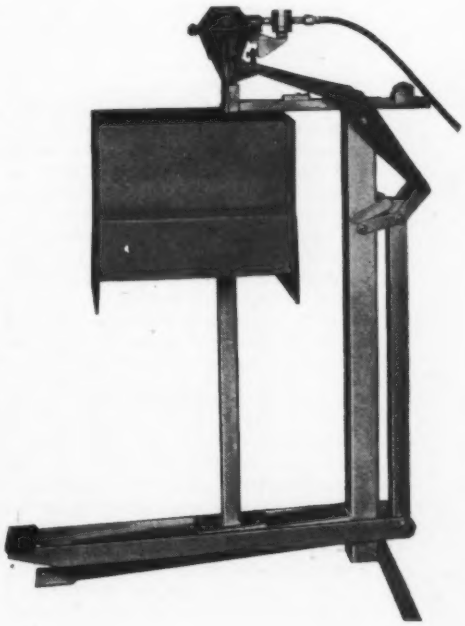
PORTABLE CARTON STAPLING MACHINE

Only four clips are needed to close the average carton with the new model C-P pneumatic stapling machine introduced by the Container Stapling Corporation, 27th Street and I.C.R.R., Herrin, Illinois, U.S.A. No wire stitching, steel strapping, gummed tape nor glue are required. It drives King-Size clips at the rate of 200/min. It is operated by a diaphragm chamber which requires no lubrication as it has only one moving part which develops no friction. This single-acting power device is friction-free because, unlike an air cylinder, the piston is never in contact with the walls. The valve, pneumatically controlled and selected for high-speed heavy-duty service, can operate at the rate of 30,000 cycles/hr.

The machine is simply connected to an air line supplying 60-80 lb/in² when it is ready to operate. It weighs only 75 lb and, being portable, can be easily moved to the work, thus saving time, labour and cost of material handling. King-Size staples are unusually long for greater holding strength and are supplied with leg lengths of ½, ⅝ and ¾ in. The magazine capacity is either 150 or 250 staples as required.

Distributors in Great Britain are Industrial Stapling and Packaging, Ltd., 7-9 Rathbone Street, London W.1, J. and H. Rosenheim & Co., 80 York Street, Glasgow and in Ireland, Henry Jackson, Ltd., 4 South Great George's Street, Dublin.

Now available in this country, the new Model C-P pneumatic stapling machine, produced in America by the Container Stapling Corporation



TRADE NOTES

Martonair, Ltd.

Martonair, Ltd., manufacturers of pneumatic equipment, have announced the appointment of agents for the Central African Federation and the Union of South Africa (except Port Elizabeth area). The agents are: Ernest Loew & Co. (Pty)., Ltd., Cr. 5th Ave. and 5th St., Booysens Reserve, Johannesburg.

British Ropeway Engineering Co., Ltd.

Alex Dewar has been appointed British Ropeway Engineering Co., Ltd.'s, agent for the whole of Scotland. He succeeds the late John Thomson, and was formerly with the National Coal Board for 30 years. Mr. Dewar's address is Green Bank, Cumnock, Ayrshire. Tel.: Cumnock 3297.

J. H. Fenner & Co., Ltd.

S. B. Hainsworth, chairman and managing director of J. H. Fenner & Co., Ltd., has announced the formation of Fenner Woodroffe & Co. Private, Ltd., in Madras, in association with Gordon Woodroffe & Co. The new company will manufacture leather power transmission belting for distribution through the depots and agents of J. H. Fenner & Co. (Overseas), Ltd., and Henry F. Cockill & Sons, Ltd., in India and certain markets in the East.

Becker Equipment and Lifts Ltd.

It is announced that the name of Equipment Repairs, Ltd., Twin-Lift Works, Alperton Viaduct, Alperton, Wembley, Middlesex, has been changed to Becker Equipment & Lifts, Ltd.

Lockers (Engineers), Ltd.

In future all equipment manufactured by Lockers (Engineers), Ltd., will be handled by Vimec Equipment, Ltd., Church Street, Warrington.

British MonoRail, Ltd.

New technical and sales agreements have been concluded on behalf of British MonoRail, Ltd., Brighouse, Yorkshire, with American MonoRail Co., Cleveland, Ohio, U.S.A., who have been in technical co-operation with British MonoRail, Ltd., for many years. The new agreements are part of a reorganization scheme to promote the expansion of British MonoRail Ltd.'s activities, now that it is in a position to offer a complete overhead materials handling system in conjunction with the products of Herbert Morris, Ltd.

Tecalmit, Ltd.

Tecalemit, Ltd., have bought all the shares in Industrial & Domestic Heaters, Ltd., who manufacture and sell the 'Selectos' system. Tecalemit, Ltd., has also purchased a majority interest in British Oil Burners, Ltd., who are combustion engineers largely engaged in the installation of 'Selectos' burners. The acquisition of these two businesses represents a widening of Tecalemit's interest in the oil-firing business field in which they are already well established with their own industrial burner.

George Cohen (Dublin), Ltd.

A new company, George Cohen (Dublin), Ltd., has been formed to undertake general machinery trading in the Republic of Eire. At the depot of the new company, Georges Place, Black Rock, Dublin, a contractors' plant hire fleet is available, including such diverse items as cranes, compressors and welding sets. The depot also holds stocks of machine tools for sale.

Matbro, Ltd.

A new works at Horley has been acquired for the Matbro range of fork lift trucks and loading shovels, and where all production, sales, and service of the Matbro range will be carried out. A new company, Matbro, Ltd., will be responsible for this side of the business, and the new address and title will be: Matbro Works, Horley, Surrey. Tel.: Horley 4441 (5 lines). Telegrams and cables: Matbro, Horley, Surrey. This change does not affect other companies in the group, namely, Mathew Bros. & Power Plant Hire, Ltd., operating from Matbro House, 87 Beddington Lane, Croydon.

Inspection Services, Ltd.

Inspection Services, Ltd., and R. F. Fraser-Smith announce that they have merged their interests. Enquiries and orders for non-destructive testing equipment, including radioactive isotope containers, and a new portable magnetic crack detector, weighing 45 lb, giving an output of 750 amp, should be addressed to: Inspection Services, Ltd., Oldfields Trading Estate, Sutton By-Pass, Sutton, Surrey. Tel.: Fairlands 4546/7/8.

Staveley Coal & Iron Co., Ltd.

The Staveley Coal & Iron Co., Ltd., have acquired R. J. Richardsons & Sons, Ltd., Birmingham; Rowland Priest, Ltd., Cradley Heath and Shotblasting (Midlands), Ltd., Cradley Heath.

Keelavite Hydraulics, Ltd.

Keelavite Hydraulics, Ltd., have concluded an agreement to manufacture and sell in Europe and the U.K. the rotary torque actuator (ROTAC) units of the EX-CELL-O Corporation of America. The first series to be made in Gt. Britain will be the RN series. There are single and double vane units, fitted with needle roller bearings.

New Warehouse for Chain Grocers

A vast, fully mechanized warehouse, with facilities for loading and unloading lorries under cover, has been built at Cheshunt, Herts., for Tesco Stores, the chain grocers. A single-storey building covering 140,000 sq. ft., the warehouse was designed for fast throughput after a close study of modern practice in this country and the United States.

The building is the holding and servicing headquarters for 150 stores in the Home Counties, and because of the keen price-cutting policy of the company warehousing and distribution costs must be kept to a minimum. Loading bays have been abolished. Lorries drive right into the loading and unloading areas and the goods are loaded by electrically operated conveyors. Conveyors with adjustable extensions can deal with vehicles of any height and length.

The warehouse is heated throughout and in bad weather the doors can be closed so that unloading can be carried out in warmth and comfort by the staff, while the goods are kept in perfect condition. Crates and boxes are put straight from the conveyors on to fork lift trucks and the pallet loads are then stacked on steel racks.

The three-tier-racking system is designed for easy off-loading at ground-floor level. Goods are stacked according to the speed of turnover and each pallet load of groceries reaches ground-floor level at the time it is needed to make up a consignment. Goods are then moved on to small tuglift trucks and hauled easily by hand to the loading conveyors.

Robot Workshop Tours Europe

Two leading British manufacturers, Rootes Motors and E.M.I. Electronics, Ltd., are collaborating in a joint venture to promote their products in European markets. An up-to-date robot workshop, in the form of a Commer tractor/trailer unit, is to 'barnstorm' European industrial centres.

The demonstration unit, consisting of a Commer 12-ton diesel engine tractor hauling a mobile workshop body in which working electronically controlled machine tools are installed, will be on view at the Paris Machine Tool Exhibition. From here, the vehicle will travel to industrial centres in Holland, Belgium, Germany, Switzerland and Italy. Rootes and E.M.I. agents will ensure the entire programme is fully co-ordinated, and leading industrialists and transport operators will receive invitations to demonstrations of both the tractor and the electronic equipment.

The 25-ft long semi-trailer, based on a Hands 12-ton drop-frame chassis and fitted with bodywork by Cecil Saunders, Ltd., is equipped with a programmer's office, where punched tape is prepared to produce any type of work piece, and a workshop in which is mounted a large

(*continued on page* 553)

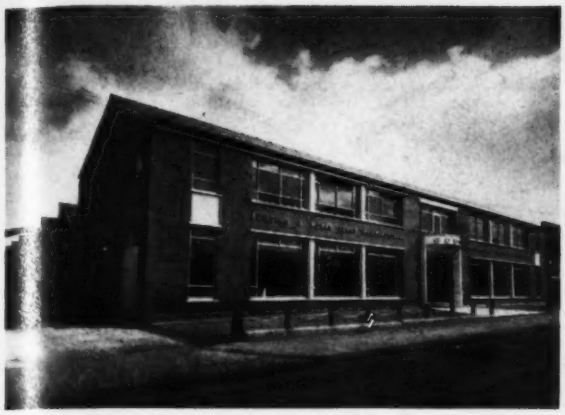
October

The above issue will contain the following articles

Materials Handling Developments at Hoover, Ltd.

The first instalment of an article dealing with British industrial trucks, ranging from hand trucks to powered trucks

and regular features



New showrooms, stores and offices recently opened by Gough & Co. (Hanley) Ltd., at Clough Street, Hanley, Stoke-on-Trent

Henry Le Tall, Ltd., millers and corn merchants, Lincoln, have recently added an Aldersley Vac-U-Vator to their range of handling equipment. The illustration shows how the work of their bulk grain transport fleet is being eased and turn round speeded up with this recent addition

A David Brown 900 industrial tractor, which is also equipped for shunting rolling stock, is regularly used for the internal transport of large castings at the Birkenhead works of The Manganese Bronze & Brass Co., Ltd. In this picture the tractor is seen transporting a 50-ton ship's propeller from the foundry to the machine shop →

Kearney & Trecker milling machine. Of completely new design, the machine is capable of carrying out the most complex shaping and cutting operations, controlled entirely from punched tape. It is, as the other electrical equipment, supplied with power generated by a revolving armature alternator attached to a sub-frame bolted to the tractor chassis and driven from the engine through the power take-off. To maintain a constant engine speed when the alternator is operating, a C.A.V. all-speed hydraulic governor is fitted to the fuel injection pump.

As the milling machine alone weighs over 3½ tons, and as high road speeds will be required, a Commer 12-ton diesel tractor was selected for the prime mover. The vehicle is fitted with a 105-b.h.p. opposed piston, two-stroke engine with blower assisted scavenge, a constant mesh, five-speed gear-box, and a two-speed rear axle.

Powerful air pressure-hydraulic brakes are specified, and to minimize strain when driving for long periods, power steering and front shock absorbers are fitted. In addition, a heater is provided in the cab.

Fitted with a full three-seater, forward control cab, and show finished with a polished chromium-plated radiator grille and fittings, the tractor/trailer unit will be an impressive sight on Continental roads.

Order from Yugoslavia

Marco Conveyor & Engineering Co., Ltd., of London in conjunction with the Constructional Engineering Co., Ltd., of Birmingham, have obtained an order from Yugoslavia for the supply of a complete mechanized foundry for the production of tractor engines. The order has been obtained in the face of competition both from home and abroad.

The whole of the equipment will be designed in Great Britain, but some portions of the steelwork will be fabricated in Yugoslavia. The value of the equipment to be manufactured in Great Britain is £73,000.

Scrapers Ordered for Power Station

The Southern Project Group of the Central Electricity Generating Board have ordered two Euclid TC-12 crawler tractors and three Euclid B10FDT scrapers for the material handling at the new Northfleet Power Station. The power station will be one of Europe's largest conventional-type stations and at peak capacity will generate 6 × 120 mW. The estimated annual consumption of coal will be approximately one and three-quarter million tons.

During recent trials with the TC-12 various distances were measured, pegged out and all grades accurately assessed by theodolite. The demonstration machine worked from a stacker conveyor or alternatively from previously laid down coal piles of known quantities. Working under these calculated conditions the 425-h.p. TC-12 fitted with a standard 22-ft coal blade proved that it was capable of stocking out at a rate of 525 tons/hr up an adverse grade of 20 per cent from a radius of 200 ft.

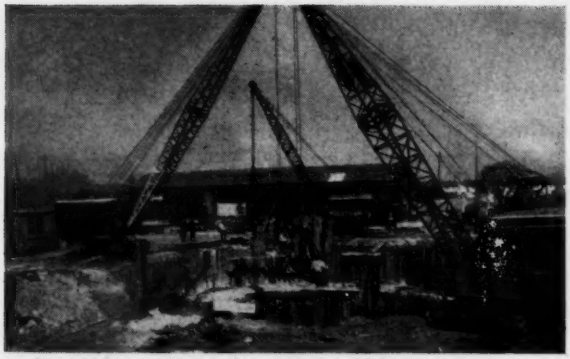
During the reclaiming trials, which were carried out under similar conditions, coal was dozed various distances up to 3·5 per cent and 5 per cent grades into a ground hopper and weighed by belt weigher on its way to the bunkers. The reclaiming rate from a radius of 200 ft up a grade of 3·5 per cent was 970 ton/hr. It was also proved that the Euclid TC-12 'twin-powered' crawler tractor, working on a flat grade from a radius of 200 ft, was capable of reclaiming more than 1,000 ton/hr.

The Cummins powered Euclid B10FDT 12-yd scrapers will be used for the removal of the P.F. fly dust and bottom ash to a disposal area. Due to local housing in the vicinity of the Northfleet Power Station, the elimination of unnecessary dust is most important. The three units together will be capable of handling ash and dust at the rate of approximately 12,000 ton/week.

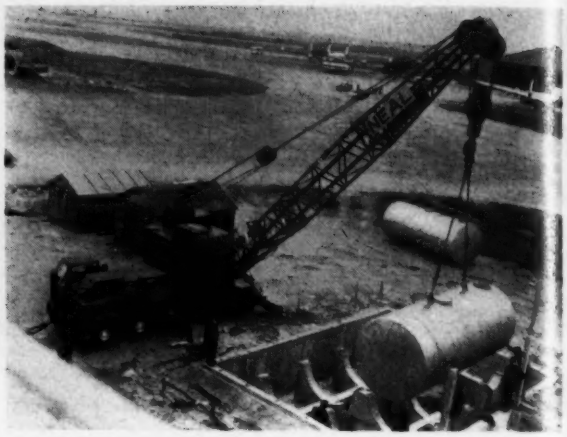
Automation in Biscuit Making

Carr's of Carlisle have embarked on an extensive modernization programme of their biscuit factory. For some time past, most of the ingredients have been brought into their factory in bulk and the present programme involves the installation of a bulk flour plant and the fully automatic distribution, weighing and delivery of all ingredients direct to the mixers.

They have called in two firms to design and supply the equipment for delivering and controlling the flour. The contract for the first stage of the project has been placed with Thomas Robinson & Son, Ltd., flour milling and conveying engineers, who are working in collaboration with Elliott Bros. (London), Ltd., in devising the automatic system. Flour will be



This photograph shows two 33 R.B. Ruston excavators fitted with twin rope grabs on deep excavation work in East London as supplied to G. P. Trentham, Ltd. by the plant hire department of Sand & Shingle, Ltd. The total depth, mainly in London clay, will be 50 ft



The illustration shows a Neal 25 ton truck-mounted crane positioning fuel tanks for the engine test base on the new British European Airways engineering maintenance site at London Airport.

brought to the factory in bulk vehicles and will be conveyed pneumatically throughout the storage, processing and weighing operations by the Robinson Pneu-Flow pressure conveying system.

The installation, which is due to be completed later this year, is part of a comprehensive plan for re-equipping Carr's biscuit factory to the latest techniques in automation. When the work has been completed Carr's biscuit making machinery will be as up to date as any to be found elsewhere in the world.

In the plant now ordered the recipe cards are in the form of a specially designed punch card. There are dozens of these cards, each one corresponding to one of the dozens of different recipes from which Carr's biscuits are made. Those which are required for the day's make of biscuits are inserted in the control panel. The recipes wanted are selected, according to demand, by an electronic searcher and stored in the memory of the control panel. The appropriate quantities of different grades of ingredients are then selected automatically and delivered to each mixer.

The distribution and metering of plastic fat, syrup and glucose is done with equipment specially developed for the purpose by Carr's Engineering Department. The mixing time of the ingredients is time controlled and the dough is tipped into hoppers to be fed continuously into the biscuit-making machines.

Halfords Choose Metalrax

The recent installation of Metalrax heavy-duty steel shelving at the new warehouse of the Halford Cycle Co., in Corporation Street, Birmingham, includes racking of new design, namely, Metalrax heavy-duty roller-type steel shelving. It comprises 161 units, each 9 ft 4 in high × 2 ft wide and 4 ft from back to front, fitted with Weldmesh partitions.

Each unit includes two shelves, each 2 ft square, mounted on rollers so that fast-moving products can be loaded from one side, unloaded from the other, and as one shelf is emptied it is transferred to the other side for re-loading while the loaded shelf is quickly and easily pushed across to the unloading side.

Also installed on each of the five floors are 178 units of standard Metalrax heavy-duty steel shelving comprising 146 units, 8 ft 4 in high × 3 ft × 3 ft, with four shelves per unit, and 32 units, 3 ft × 2 ft, with four shelves in height. Here again, Weldmesh partitions are used. To complete the five floor storage, similar units have been transferred from the temporary Halfords warehouse at Kyotts Lake Road.

Scotland's Biggest Hydro-electric Scheme

The inauguration of the Loch Awe project at the Pass of Brander recently was not only a triumph for Scottish enterprise but a significant landmark for the British construction equipment industry too. Not only was Scotland's latest and greatest hydro-electric scheme actually under way, but the crawler tractor that cut the first sods was a British-built International BTD-20 with a British Rolls-Royce engine. This was in strong contrast with many earlier historic occasions when equipment of this type was of foreign origin.

This particular tractor was carrying out key work for A. M. Carmichael, Ltd., one of the largest civil engineering contractors in Scotland, who received the contract for a road diversion, which is being carried out in advance of other work on the Loch Awe project to maintain the flow of main road traffic to Oban.

The entire project of the North of Scotland Hydro-electric Board is due to be completed by mid-1960 and will cost approximately £26½ million. It is vast and ultra-modern in conception, making use of the water power of an area of over 300 square miles. Electricity provided by the Hunterston Atomic Power Station will pump water 1,000 ft up Ben Cruachan, there to be held by a dam. The power used to pump the water will be the excess generated at night or at weekends by nuclear means, whereas the dammed water can provide electricity at peak periods and at need as it descends again to Loch Awe.

Small Wheeled Containers

British Transport Commission have awarded another contract to W. C. Youngman, Ltd., for the supply of small wheeled containers. Having a capacity of 70 cu. ft., load 1 ton, these containers were especially designed for B.T.C. The four wheels are mounted on castors so constructed that all four can be free for close parking inside railway wagons or lorries, the rear pair can be locked for towing along the platforms, or all four can be withdrawn leaving the container rigidly supported on legs while in transit in a wagon or lorry. They are entirely pilfer-

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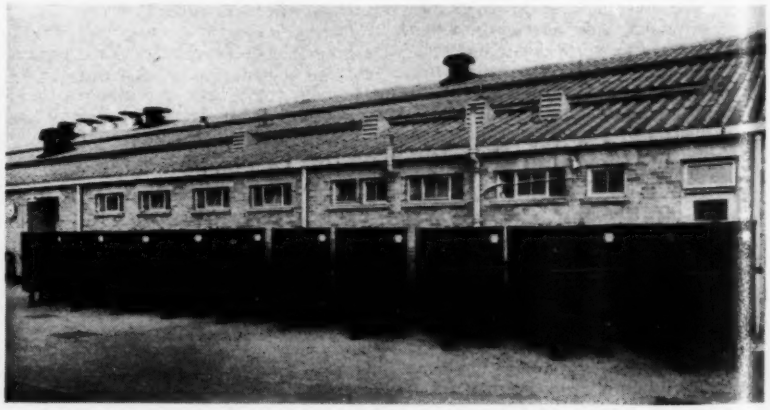


A consignment of small wheeled containers made by W. C. Youngman, Ltd., and designed especially for B.T.C.

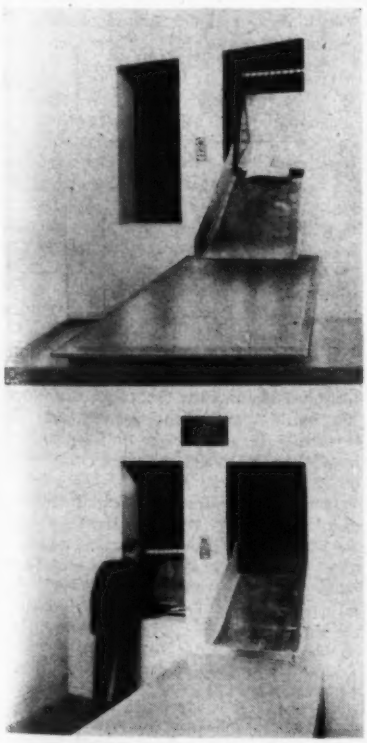
proof, being loaded by the customer at his premises and unloaded by the consignee.

Corresponding Elevator at New Building

The composite illustration shows the working of the 'Paternoster'-type correspondence elevator supplied by T. & T. Works, Ltd., through the main contractors, Gilbert, Ash, Ltd., and the Ministry of Works, for the new multi-storey Air Ministry Building in Whitehall Gardens, London. The elevator is of the 'Paternoster' type, that is to say it has two offset runs of heavy-duty precision roller chain carrying a series of cages or containers and normally running continuously in one direction only.

The bottom half of the illustrations shows the post room situation in the basement and normally all mail, etc., is received from and distributed to all floors at this point, but at the same time it is also possible for a consignment of any suitable nature to be sent from one floor to another. The containers are roughly the size and shape of a tea chest which has been cut across diagonally and are strongly constructed from aluminium plate, while every container is hinged in its cage so that on arrival at the appropriate floor it can be tipped forward and the contents, which may be anything from a single letter or sheet of paper to very bulky books, files etc., are deposited down the chute on to the table. The cages and containers on the left-hand side are constantly travelling downwards and it is in this position that they are loaded, and on the right-hand side they are travelling upwards and from the top-going side of the elevator discharge is effected.

Paternoster correspondence elevator supplied by T. & T. Works, Ltd., for new Air Ministry Building



Control is by push button and the row of numbered push buttons can be seen across the top of each container, and on loading material into one of the cages all that is necessary is to press the appropriately numbered push button and on arrival at the corresponding floor the tray will tip and the contents be discharged. A very comprehensive series of safety devices are fitted; there is little risk of accident on the up-going side as there is no occasion for any person or article to be in a position where they could be trapped, but on the descending side with a continuously travelling cage there could be serious risk if it were not for careful precautions, and two principal types of device are fitted; there is a special safety guard under each tray which at a comparatively light touch actuates a stop switch, and at the same time there is a cill guard again actuating a stop, so that any person or article trapped either below or inside the cage will effect an immediate stop of the whole device.

Above the openings in the post room can be seen a warning light panel and in the event of safety devices being actuated on any of the floors a numbered light appears on this panel so that the trouble can be traced and rectified with a minimum of delay.

Crone & Taylor Meteor thrower used by I.C.I., Ltd., (Salt Division) for handling salt at Weston Port Works, Runcorn

Loading 300 Tons of Salt Per Hour

A Crone & Taylor bulk cargo loader has proved to be a rapid and efficient means of loading salt into ships at the Weston Port Works, Runcorn, of Imperial Chemical Industries, Ltd. (Salt Division).

The equipment is mounted upon wide-gauge rails which run the length of the loading wharf and the superstructure supporting the conveyors is mounted upon a power-operated turntable. The salt is loaded into the feeder conveyor from the adjacent store by mobile shovels. Alternatively, it can be brought by lorry from more distant storage areas and tipped directly into the feed hopper. The feed hopper belt is rubber covered and 6 ft in width and the feeder is provided with retracting gear to clear the 60-ft main conveyor boom when it is raised to maximum height when not in use.

The upper floor of the tower is the control room from which all operations are effected by one man by means of push buttons, and full safety precautions are included throughout in the shape of automatic trip and overrun switches.

A C. & T. Meteor thrower is suspended from the 60-ft conveyor and this is provided with independent elevating gear operated from the control room. Fibreglass telescopic chutes are provided to guide the salt into the thrower, and an effective ball thrust ring encircles the feed chute and permits free rotation in the hold by means of hand lines which can be controlled by one man.

The equipment handles salt easily at the rate of 300 tons/hr.

Pneumatic Handling Equipment for Marine Terminal

The Globe Pneumatic Engineering Co. have been successful in obtaining the contract for the mechanical handling equipment to be installed on the marine terminal at Milford Haven Refinery. The order was placed by the main contractors, Foster Wheeler, Ltd., on behalf of the owners, the Esso Petroleum Co., Ltd.

The equipment to be supplied includes hoists of up to 6 ton capacity with a lift of 100 ft, and 12-ton-capacity winches, lifting loads of approximately 50 tons through multi-purchase sheaves. Globe Pneumatic Engineering Co., Ltd., have designed the complete pneumatic installation and an interesting feature is the fact

that all units are to be operated by variable-speed remote-control valves.

British Railways Reorganizing Steel Works

The most modern type of electric arc furnaces with improved ventilation and fume extraction will be provided for the production of steel castings in Crewe Works when a new building in the Steel Foundry, now in course of erection, is completed.

The Steel Foundry produces, among other things, cylinders, axleboxes and wheel centres for locomotives and, as supplies of suitable anthracite are less readily available and the existing plant is now life-expired, the London Midland Region are replacing the existing rotary-type furnaces and associated equipment with two 3-4-ton basic electric furnaces and two 10-ton electric overhead travelling cranes. The housing of this new equipment in a new building will enable all the melting to be conducted away from the main foundry, thus preventing the fumes penetrating into the main shop. The new furnaces, being of the basic type and melting at higher temperature, will also ensure a better quality of castings being produced, with considerable economies being achieved by using lower-grade scrap than is the case with the existing acid-type furnaces.

A 60-ton wagon tippler recently completed in the Erith Engineering Works of the General Electric Co., Ltd., to the order of Ross Engineers, Ltd., for John Lysaght's Scunthorpe Works, Ltd. It will be installed in the new ore preparation and sintering plant that is being erected at Scunthorpe for tipping the wagons of the incoming ore trains. In the background is one of the five 37½-ton wagon tipplers being manufactured for the Indian Government's new iron and steel works at Durgapur

Mr. Ivan Kudryavtsev strips back conveyor belt fabric to prepare for splicing. He was a member of a four-man delegation of Soviet engineers paying a follow-up visit to the BTR factory at Leyland, Lancs, to see on-site splicing techniques in connection with the contract for six miles of rubber-covered 'Terylene' belting for Russia recently completed by BTR

Provision is also made in the buildings for the storage of scrap metal and other melting requisites, space for re-bricking the roof rings of the furnaces etc., all of which will be serviced by one of the overhead travelling cranes. The building will also house the electrical arrangements, including the transformers and switchgear, and provision for the furnacemen's amenities in line with the Factories Act regulations.

No provision has yet been made for the raising of the incoming electric power supplies into the works which will eventually be necessary, although a scheme is now being developed for increased power to meet the normal growth of the electrical load.

Power Station for Mexico

The British Thomson-Houston Export Co., Ltd., now incorporated in Associated Electrical Industries Export, Ltd., recently received an order through its agent Lic. J. O. Aragon in Mexico City to construct and equip a complete steam power station for the Federal Electricity Commission of Mexico. The station will be built at Juchitan in the state of Oaxaca, and is to be in commission early in 1961, and will supply electricity to an area on the Pacific coast.

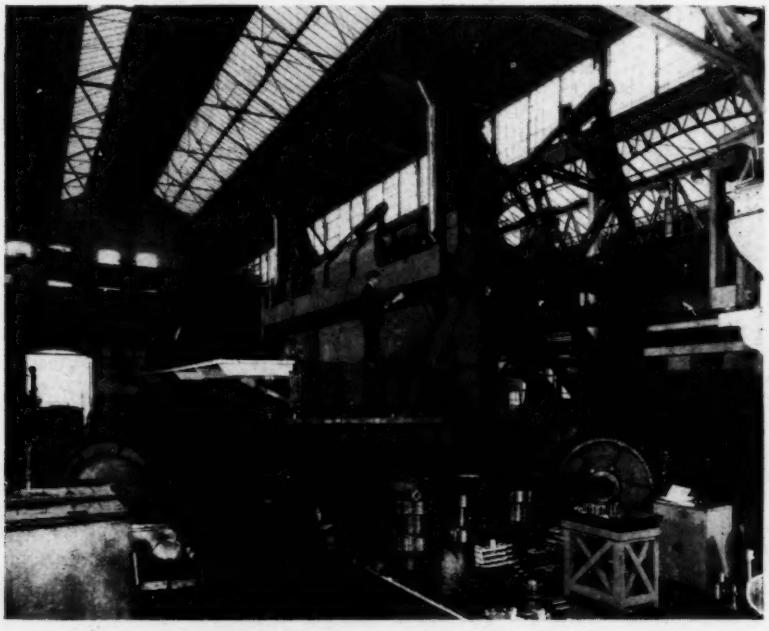
Standardized designs have been developed by A.E.I. for steam/electric power stations complete with buildings and plant, and, although in this case foreign competitors made similar claims, it is understood that the accepted design by A.E.I. was nearer completion and capable of construction in the shortest time.

Generating plant will be manufactured by A.E.I. Turbine-Generator Division at their factories in Rugby and Glasgow. Initially, two 6,250-kW turbine-generators will be supplied, for operation with turbine stop valve steam conditions of 400 lb/sq. in., 752 deg F, and condenser vacuum of 27·5 in Hg. The generators will be rated at 7,812·5 kVA, 0·8 pf and will supply 60 c/s, 3-phase, alternating current at 13·8 kV.

Two boilers, each rated at 72,500 lb/hr, are to be supplied by International Combustion, Ltd., of Derby. The cooling towers for this installation will be supplied by Film Cooling Towers, Ltd., of London.

All the miscellaneous equipment is included in the contract to complete the initial stage of the power station, which is to be constructed to accommodate a third turbine-generator and boiler plant at some future date.

The contract includes the designs for the buildings and civil engineering works; these have been prepared by Norris Consultants, Ltd., of Bristol, working in conjunction with A.E.I. Turbine-Generator Division.



British Standard for Power-driven Mast Hoists for Materials

This new publication provides guidance for the manufacturer and the user of builders' hoists of the mast type. It specifies requirements for a non-passenger power-driven hoist not exceeding 50 cwt capacity, for temporary use on construction work, in which a platform for lifting materials is supported and guided by a mast.

Because of its use in exposed situations there are inherent dangers in this type of hoist. The standard requires, therefore, that minimum safety requirements be observed and that design and testing are, as far as possible, in conformity with cranes in general.

Qualities of materials and equipment are specified for all important parts of the hoist. For this purpose, a four-page appendix lists specified British Standards under five main headings: materials, structural details, machinery and machinery details, electrical machinery and equipment, lifting equipment.

One of the Standards' four appendices

(*continued on page* 557)

summarizes 19 items of information which the manufacturer should supply with a tender. In dealing with the design of these hoists, full consideration has been given to the eccentric loading of the platform.

Copies of this Standard may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London, W.1, price 5s. (postage is extra to non-subscribers).

Change of Address

The British Hoist & Crane Co.'s London depot has removed to Stevenage Wharf, Stevenage Road, Fulham, S.W.6. Tel.: Fulham 3207.

Sutcliffe Hydraulics, Ltd., manufacturers of hydraulic equipment for a wide range of mining and industrial application, have moved from North Featherstone, Yorkshire, to Speedwell Works, Castleford, Yorkshire.

Ruston-Bucyrus, Ltd., have opened their first sales and service depot, in Priorswood Road, Taunton, Somerset. This depot, the first of a number to be established throughout Great Britain, serves the south-western area and is to be followed by a similar depot in Warrington, Lancashire, to serve the north-western area.

Ruston-Bucyrus announce this new development as part of their expanding policy of bringing sales and spares services closer to their customers.

The new address of the Glasgow office of **E.M.B. Co., Ltd.**, is 17 Woodlands Road, Thornliebank, Glasgow. Tel.: Giffnock 0188.

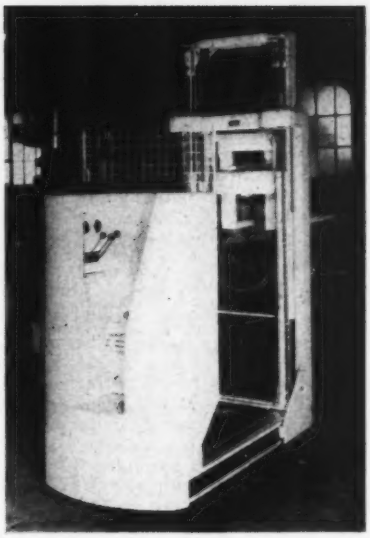
The address of the Bristol branch office of **The English Electric Co.** is now Equity & Law Building, 36-38 Baldwin Street, Bristol 1. The telephone number remains the same, Bristol 27304.

In accordance with current centralization policy, **David Brown Construction Equipment, Ltd.**, have moved their Home and Export sales departments from Hanworth Park, Feltham, Middlesex, to the main David Brown tractor factory at Meltham Mills, near Huddersfield. Simultaneously the northern parts and service depot of David Brown Construction Equipment, Ltd., has been transferred from Moll Springs, Netherton, nr. Huddersfield, to the principal David Brown parts and service factory, Scarr Bottom, near Huddersfield.

The present parts and service depot of David Brown Construction Equipment, Ltd., is being retained at Hanworth Park, Feltham, to serve customers in the southern area of the United Kingdom.

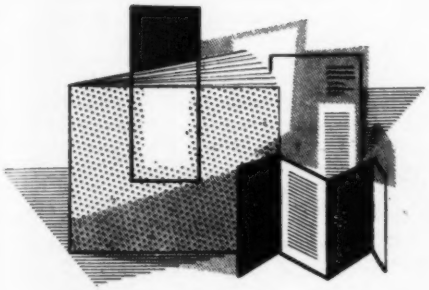
The London office of **The D.P. Battery Co., Ltd.**, manufacturers of Kathanode and Tudor batteries, is now in new premises at 137 Victoria Street, London, S.W.1.

The Newcastle office of the Lancashire Dynamo Group Sales, Ltd., has been moved to new premises at Eagle Star House, 23-34 Mosely Street, Newcastle upon Tyne 1. The telephone number remains unchanged: Newcastle 28621-29736.



The Cleco Reach Truck

In our June issue, page 317, in a technical report on a reach truck, we stated that the first reach truck was produced by the firm whose products we were reviewing. We are asked to state that this is not so, as the first travelling gallows, or reach truck, was, of course, produced by Cleco Electric Industries, Ltd., Leicester, some years previously.



ABSTRACTS AND REFERENCES

Articles on mechanical handling published in all technical and industrial journals of the world are indexed and abstracted below. Whenever it is known, the published price of the journal containing the article is given.

The addresses of the publications concerned are given and applications for copies of the journals mentioned should be made direct.

AIR-ASSISTED HANDLING

Pneumatic "Fluidizing" Speeds Bulk Powder Transfer. *Design News*, 85W Harrison Street, Chicago, Ill., U.S.A. July 20th, 1959. P. 16. $1.

A Swedish method of loading and unloading bulk powder is to be used for new railway wagons on order by the Dutch State Railways. This, it is explained, is to produce an upward flow of air through the powder, so reducing material cohesion of the powder grains. Under such conditions of unstable equilibrium between upward lift and gravity effect, the powder takes on the fluid properties of liquid and is thus more quickly handled.

The rail vehicles will be equipped with spherical containers of 500 cu. ft. capacity, and materials such as cement, soda, aluminium hydroxide and chalk in fluid condition will be loaded in at the top through a 10-in manhole. To unload a container, air is introduced through a wool filter at the bottom, and the powder is then poured out through a 4-in drain opening in the filter. Pressure applied above the powder speeds unloading.

HIGH POWER AND LIFT

300-h.p. Loader. *Excavating Engineer*, Milwaukee, Wisconsin, U.S.A. July, 1959. Pp. 53 and 54. 35c.

Said to have the highest dumping clearance, longest reach and most powerful engine of any tractor-shovel of its size and capacity range, a recently introduced machine of this class is powered by a turbo-charged Cummins diesel engine which develops 300 h.p. at 2,100 r.p.m. The maximum height of raised bucket is 19 ft 2½ in, with clearance to centre of hinge pin of 14 ft 7½ in. With the bucket dumped at 50 deg, clearance under the bucket edge is 10 ft 10 in and the forward reach from the front tyre is 3 ft 6 in. Lifting capacity is conservatively rated at 12,000 lb and buckets of 3 to 6 cu. yd. capacity are available.

For digging operations the machine has a break-out force of 26,600 lb and the bucket can be tipped back 40 deg at ground level. Other features are a four-speed forward and reverse power-shift transmission, matched torque converter and power-transfer differential gears whereby additional torque is automatically transferred to the wheels having the best grip on slippery ground.

FOOD CONVEYOR BELT PRODUCTION

Conveyor Belting Used in Food Processing. By J. Wallace Rowland, Jr., *Rubber Age*, 101 West 31st Street, New York, 1. July, 1959. Pp.611-614. $5 per annum (U.S.A.), $5.50 (Canada), $6 (other countries).

The production of conveyor belting used in food processing is said to be one of the most highly specialized segments of the rubber industry. The author points out that the belting must be resistant to

the action of oils, fats, sugars, salt and other chemicals, combined with sub-zero and elevated temperatures, wet processing and abrasive substances conveyed. It must also be resistant to alkalis, detergents, steam and sanitizers applied to keep the surface sanitary. The numerous problems presented and how they are dealt with in conveyor belt manufacture are discussed, and reference is made to the special features of nitrile rubber which have resulted in its increasing application to food conveyor belting during the past five years.

LIGHTER TRAVELLING CRANES
Weight Savings Dictate Aluminium Crane Design. *Iron and Steel Engineer*, 1010 Empire Building, Pittsburg, 22, Pennsylvania, U.S.A. July, 1959. P. 144. $1.50.

Two overhead travelling cranes are briefly described and said to have been recently installed in the U.S. Navy Yard at Portsmouth, N.H. They have their major component structures of aluminium alloy, representing 55 per cent of the weight. Each has a span of 102 ft 3 in, with a 15-ft spread across the bridge girders, and is equipped with an all-aluminium trolley frame carrying a main hoist of 45 tons capacity and an auxiliary 5-ton hoist. The two cranes operate on a common runway, and can be locked together by a special device for using a special all-aluminium equalizer lifting beam capable of handling lifts of about 90 tons. Wherever aluminium parts are mated to steel, a special non-conductive coating material is applied at the joints to prevent corrosion from electrolytic action.

ACCELERATED SOLDERING PROCESS
Automatic Standing-Wave Soldering Line. *American Machinist*, 330 West 42nd Street, New York, 36, U.S.A. July 27th, 1959. P. 137. 75c.

An automatic soldering system is stated to boost production and eliminate rejects in processing circuit boards or other electronic or machine components. Conveyance of the products, application of flux, removal of solvent, preheating of flux and product and soldering are handled automatically. The system is applicable for processing components up to 9½ in wide and up to any practical length.

Molten solder, in the form of a standing wave, is brought up to the underside of the product assembly by a Flowsolder unit, the major components of which are a special conveyor, fluxing unit, heat bank, adjustable carrier and soldering unit. More precise control and improved soldering conditions are said to result in higher shear strength and greater reliability.

MECHANICAL HANDLING OF SCRAP
Scrap Handling Programs—How to Plan them for Profit. *Plant Engineering*, 308E James Street, Barrington Ill., U.S.A. Pp. 114-116. $1.

Higher salvage prices, more usable floor space and improved plant safety are credited to mechanical scrap handling systems in an article describing the methods employed by a number of American manufacturers. It is pointed out that the type of system used depends upon the scrap volume, machine tool arrangement, processing requirements and methods of disposal. Some form of conveyor is used, and it is stated that three basic types are available for either batch or continuous handling. These are the hinged pan, bucket elevator and oscillating conveyor, which can be adapted to solve any scrap handling problem.

In one case referred to, 40 machine tools are arranged so that both chips and coolant are discharged into underfloor hinged-pan feeder conveyors which carry them to a main collecting conveyor. The latter delivers the chips to a crusher from which they are blown through a pneumatic system to storage bins for eventual disposal. The coolant is collected in troughs beneath the conveyors and is piped to a flotation unit which reconditions it and returns it to the supply tank.

IMPROVING VERTICAL CONVEYORS
Hints on Elevator Belts. *Mechanical World*, 31 King Street West, Manchester, 3. July, 1959. P. 319. 2s. 6d.

Attention is drawn to a number of suggestions made by the Goodyear Tyre & Rubber Co. (Great Britain), Ltd., for improving elevator belts. Those used under wet conditions should have cemented bucket bolt holes, and bolts should be inspected frequently, replacing any loose or broken. Tension on the foot pulley should be no more than required to make it pull without stoppage. Buckets should be at least 1 in, preferably 2 in, narrower than the belt. Vulcanized butt splices for the belt are recommended. Damage to the belt due to large particles of material falling between it and the boot pulley can be avoided by fitting sloping decks just above the latter. Fluted pulleys to prevent such damage are often desirable. On continuous-type bucket elevators material can be prevented from getting under the buckets as they discharge by fitting flaps made from old belts and held in place by the bucket bolts. Washers made from old belting under each bucket are recommended to protect the belt when handling hot materials.

LONG-DISTANCE CONVEYANCE
Two-mile Long Conveyor Belt. *Maintenance*, One River Road, Cos Cob, Connecticut, U.S.A. August, 1959. P. 13. $3 (U.S.A.), $4 (Canada), $5 (other countries).

Twenty million tons of clay and gravel needed in the construction of the Trinity River dam in Northern California are being supplied by nine flights of rayon-nylon-reinforced rubber conveyor belting extending more than two miles down a mountainside. In the article it is stated that the belt is more than 18,000 ft long and 42 in wide. It travels at 650 ft/min and carries about 1,400 cu. yd. of material an hour. Before entering the conveyor system, oversize material is reduced to about 6 in in screening and crushing plant.

REMOVING FERROUS MATERIALS FROM CONVEYORS
Electromagnetic Pulley. *Mechanical Engineering*, 20th and Northampton Streets, Easton, Pa., U.S.A. July, 1959. P. 145. 50c.

Brief reference is made to a new range of electromagnetic pulleys for removing ferrous materials from non-ferrous when handled in bulk by belt conveyors. It is stated that positive separation is assured at belt speeds up to 600 ft/min. Applications of magnetic pulleys in modern process industries are explained in a bulletin, and information relating to the selection of the right size of pulley is also included.

HANDLING LOADS IN CONFINED SPACES
Cramped Areas No Curb to New Trucks. *Chemical Engineering*, 330 West 42nd Street, New York, 36, U.S.A. August 10th, 1959. Pp. 88 and 90. $2.

At a recent Material Handling Institution's exhibition it is stated that many fork lift truck manufacturers introduced new models designed to improve three-dimensional manoeuvrability in confined areas. Reference is made to an example which can stack heavy loads at right angles in aisles only 6 ft wide. It is fitted with hydraulically operated outriggers and can lift loads at 70 ft/min and be manoeuvred through congested areas with the speed and agility of conventional trucks. Another type, of 4,000 lb capacity, is only 38 in wide and can stack 4-ft loads at right angles along a 7-ft wide strip. The controls for braking, acceleration and direction selection are combined in a single roller-grip handle. Other types shown can move sideways as well as forward and backward, and one of them is able to reach over one load to lift another behind it.

RECENT PATENTS

The following are brief extracts of recent United Kingdom patents which we believe will interest our readers. For full details the original patent specifications should be consulted at, or bought (3s. 6d. each) from, The Patents Office, Southampton Buildings, Chancery Lane, London, W.C.2.

BALLAST TANKS
L. Vecchi, of Genoa.—U.K.809695.

Flexible-walled variable-size ballast tank for ships, attached to structure, collapsible on guide rollers and fitted between decks, etc. as desired.

DROPPING PLATFORM
Blackburn & General Aircraft, Yorkshire.—U.K. 809721.

Parachute heavy equipment pallet as per patent 781698 but with a crushable beam cheap in maintenance, based on a honeycomb of paper pads between hardboard panels.

SHIPPING DRUM
United States Steel Corporation.—U.K. 809723.

A form with end cap edge band in line with side hoops so that no over-riding of other drums occurs in transport.

MAGAZINE CONVEYOR
Sylvania Electric Products Inc., Mass.—U.K. 809780.

For automatic assembly of printed circuits, using inclined and parallel tracks and prevention of clogging due to base board warpage.

SCREW CRUSHER
W. T. Anson, of Cairo.—U.K. 809789.

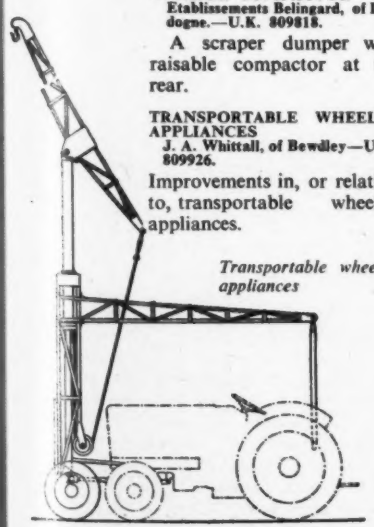
A roaster-comminuter with grooved screw thread, e.g., for coffee.

SCRAPER COMPACTOR
Etablissements Belingard, of Dordogne.—U.K. 809818.

A scraper dumper with raisable compactor at the rear.

TRANSPORTABLE WHEELED APPLIANCES
J. A. Whittall, of Bewdley—U.K. 809926.

Improvements in, or relating to, transportable wheeled appliances.



Transportable wheeled appliances

CONVEYOR SURFACE
United States Rubber Co., of New York.—U.K. 809869.

Suggest a form of moulded plastic surface cheaply made, for conveyors of good grip, using porous pads opposite the mould to avoid gas hold up and flash.

BALL ELEVATOR
American Machine & Foundry Co., New York.—U.K. 809900.

A ball handler or elevator which prevents chipping or damage and can only handle one at a time, the catch device being inoperative until previously elevated ball is ejected.

POWDER FEED
Air Reduction Co., Inc., of New York.—U.K. 809960.

Pneumatic conveyor, e.g., for iron, aluminium, sodium bicarbonate or calcium carbide powder, which can be preheated and injected, for instance, under the surface of cast iron, at a given feed rate.

ELECTROSTATIC SEPARATOR
General Mills Inc., of Minneapolis.—U.K. 809962.

Flour and bran middles, etc., separated from other parts electrostatically, using repeated close approach to an electrode and removal of attached material.

ROTARY TIPPLER
General Electric Co., of Kingsway.—U.K. 811120.

For railway wagons, etc., with a sustaining beam across them for automatic clamping.

GUIDED SKIP HOIST
Preparation Industrielle des Combustibles, of Fontainebleau.—U.K. 811124.

Pivoted discharge door design for skip at the lower edge, with underneath control and an inside slide, overcomes troubles of quadrant and guillotine doors.

MASTED LIFT TRUCKS
Yale & Towne Manufacturing Co., of New York.—U.K. 811193.

Prevent cocking or tilting of upright by slides on one of them.

FISH DRESSING
R. G. T. Baader, of Lubeck.—U.K. 811199.

Fish conveyance to cutter with belly open, tail first, with support of conveyor inside. Really a double conveyor with fish held rigid, but not unduly tensioned.

GRAIN ELEVATOR
Henry Simon, Ltd., of Stockport.—U.K. 811239.

Pneumatic seed, etc., elevator with prevention of stock retardation in feeder seal and prevention of carry back, using a spring-loaded plate acting as non-return valve at feed end.

GYPSUM CALCINATION
National Gypsum Co., of Buffalo.—U.K. 811246.

Indirect heating used to avoid over-burning, with screw conveyors.

MOBILE CRANE
Karl Kassbohner Fahrzeugwerke G.m.b.H., of Germany.—U.K. 811260.

Road crane, rotary and varied for use as salvage, towing or assembly aid—by means of movable counterweight.

HELICAL CONVEYOR
Joest G.m.b.H., of Westphalia.—U.K. 811273.

Driven by centrifugal vibrator, can have double, e.g. vertical top to top system with mass giving vibration reversal and energy storage.

HAND TRUCK
Yale & Towne Manufacturing Co., of New York.—U.K. 811275.

Design of power, etc., control switches on handle with pivoted lever operation and contact.

EXPLOSIVES PACKING
Canadian Industries, Ltd., of Montreal.—U.K. 811285.

Gelatine, etc., powders packed into paper, etc., cartridges, by a machine able to handle all grades and in various package sizes, many at a time, using cutting knives and a tamper rod action.

SPRUNG CONVEYOR
Jonas Woodhead & Sons, Ltd., of Leeds.—U.K. 811287.

Tension coil springs for rollers can be adjusted on load by angular spindle movement.

SMALL CONVEYOR
Plessey Co., Ltd.—U.K. 811322.

Condensers are moved on a wire or spring conveyor and voltage tested en route, being held by terminal grippers.

PALLETIZING CONVEYORS
Matthews Conveyor Co., Ltd., Ontario.—U.K. 811353-4-5.

Articles are assembled from conveyor feed, on to tiers on pallets for fork truck removal, by machines not limited to one shape or size. Apron assembly is followed by closing compaction with turning if desired to give an interlocking pattern. Overall size is a minimum.

DOCUMENT STEERAGE
Standard Telephone Co., of Aldwych.—U.K. 811360.

Mail sorting on conveyors is aided re steerage, by radio-active or fluorescent emission from foils on an envelope actuates a route choosing slide, somewhat as per patent 808992.

AGGREGATE SORTING
Blaw Knox Co. of Pittsburg.—U.K. 811361-2.

Mineral sorting of good accuracy, especially gravel and loose aggregate, by collecting after rebound from fall on to plates, when wet, only hard non-porous stones then have high elasticity.

SMALL CRANE
H. F. E. Backstrom, of Finland.—U.K. 811476.

A design of foundry, etc., moulding box supported by a small crane capable of dealing with varied sizes of box.

MINE WINDER CONTROL
General Electric Co., of Kingsway.—U.K. 811587.

A slip detector between drum and rope to apply safety control using tachometer comparison.

HATCH COVER
Kockums Mekaniske Verkstads, AB. of Malmo.—U.K. 811608.

A hydraulically operated ship's hatch cover with hinged links, using a pulling motion and having a small jack, less corrodible.

FLOOR TRUCKS
New Conveyor Co., of Smethwick.—U.K. 811672.

Factory floor-driven trucks with given form of automatic disengagement when an obstruction met.

LORRY TIPPER
Telehoist, Ltd., of Cheltenham.—U.K. 811678.

A design of lorry platform of minimum knocked-down size, for use with sand, gravel, etc.

ROAD ROLLERS
Aveling Barford, Ltd., of Grantham.—U.K. 811760.

A design somewhat as per patent 648169 for consolidating trenches, etc., after excavation, with a raisable beam at the front holding a pivoted smaller roller, controlled by a hydraulic ram.

BRIDGE ERECTION
Maschinenfabriken Augsburg Nurnberg A.G.—U.K. 811839.

Portable bridges erected with roller cradles of low height, rotatably supported on either sides of loops of wire cable guided in a serpentine line.

LABELLER
Distillers Co., Ltd., of Edinburgh.—U.K. 811923-4.

Relate a form of machine for cutting pre-printed adhesive tape into labels and applying them by a series of rolls on to drums or bottles, etc., avoiding hand action.

LABELLER
Distillers Co., Ltd., of Edinburgh.—U.K. 811924.

A drum labeller with pre-printed tape supplied between nip rollers.

PLANT CRUSHING
R. H. Turnbull, of London.—U.K. 811991.

Discuss patent 721878 and a canvas conveyorized belt with nip rollers above and below with positive drive of each for plant crushing, with doctor blades and arrangements to spray the plants if desired.

SIEVE DRIER
Fleissner & Sohn Maschinenfabrik, of Germany.—U.K. 812018.

Willow or drum-driers for loose fibrous material having uniform suction on the inside and may pass on a conveyor from one drum to another with external air heating.

CONVEYOR ROLLERS
J. Collis & Sons, Ltd., of London.—U.K. 812024.

Design with spindles easily replaced through side of frames, for which they also act as tie rods.

HOT CONVEYOR
Klockner Humboldt Deutz A.G., of Cologne.—U.K. 812033.

Hot coke or clinker conveyor of overlapping plate construction.

WALLBOARD DRIER
AB. Svenska Flaktfabriken.—U.K. 812042.

Sheet drier with stacked parallel conveyors running against warm air, of small space requirement.

PLASTIC DRYING
Firestone Tire & Rubber Co., of Ohio.—U.K. 812043.

Rubber and plastic pellet drying using minimum of floor space, with conveyors in cascade with baffles, running counter current to warm air.

CRANE SKIPS
Firth Bros., Ltd., of Huddersfield.—U.K. 812075.

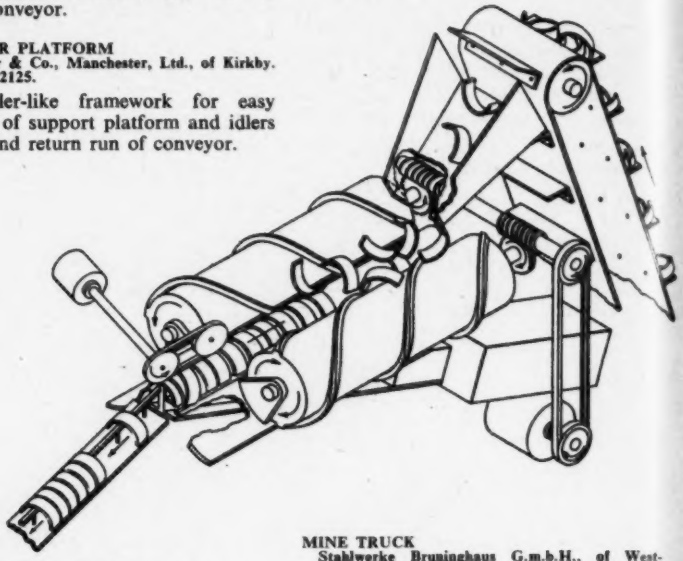
Concrete, etc., skips with bottom discharge and wiping action to clean the closure plate and bottom edge.

BELTS
Siemens & Halske A.G., of Berlin.—U.K. 812105.

A form of V-shaped letter, etc., conveyor with diversion points comprising rollers which move in to grip letter under electro-magnetic control, e.g. on to another conveyor.

CONVEYOR PLATFORM
John Kerr & Co., Manchester, Ltd., of Kirkby.—U.K. 812125.

A ladder-like framework for easy mounting of support platform and idlers of main and return run of conveyor.



Orienter for C-shaped articles

CURD DRAINING
Ch. Gervais Soc. Anon., of Paris.—U.K. 812197.

Apparatus for draining cheese curd, by a filter which is wrung out continuously on the far side, to dry it, at the end of the belt run.

SCRAPER BOX
Demag A.G., of Duisburg.—U.K. 812204.

For coal conveyors, of simple chain connection, in a recess at the top of the box.

TRUCK CONTROL
Clark Equipment Co., of Michigan.—U.K. 812236.

An electric fork lift truck to give uniform control of acceleration and retardation to prevent jolting.

PELLETIZER
Sulphates, Ltd., of Melbourne.—U.K. 812265-6.

Equipment for cooling and solidifying aluminium sulphate by injecting it molten on to some previously made solid particles, rotating in a drum, e.g., as ball mills. The drum design is given with a screw conveyor for movement to packaging.

FURNACE CONVEYOR
Gibbons Brothers, Ltd., of Dudley.—U.K. 812271.

Even heating achieved by recirculation of heated gas, under slight pressure giving temperature control and avoiding overheating of top layer passing through.

CASK WASHING
T. G. Hopkins & Sons, Ltd., of London.—U.K. 812276.

Procession past series of washing stations, of increased output, and with positive drive under hydraulic power using double-acting ram.

MALTING TURNER
K. Ostertag, of Munich.—U.K. 812302.

Machine for turning and transporting germinating grain with a bucket conveyor on a compact carriage overhead, carefully designed bucket to avoid grain tip shoot damage.

MINE TRUCK
Stahlwerke Bruninghaus G.m.b.H., of Westphalia.—U.K. 812316.

Build-up of coal dust layers avoided with scrapers on cylindrical tipping axis and scraper to clean lower parts.

POTTERY CONVEYOR
Fisher & Ludlow, Ltd., of Birmingham.—U.K. 812329-30.

Endless mould carriers somewhat as per patent 738753, with inversion to discharge excess liquor at suitable points along track. Rotation of more than 90 deg is possible, and problems of single cam followers are overcome by the use of followers with rollers having an axis different from the carrier axis.

ORIENTER
Clevite Corporation, of Cleveland.—U.K. 812361.

An orienter for C-shaped articles, e.g. half-sleeve bearing liners, using plate elevators and pairs of helical rollers for orienting them.

CHAIN CONVEYOR
G. Hopkins & Sons, Ltd., of London.—U.K. 812439.

Barrel conveyor for curved and straight paths, with inclined rollers to take place of the outer chain which dips under them.

LAYERED BELTING
Goodyear Tire & Rubber Co., of Akron.—U.K. 812458.

A laminated p.v.c. design for coal mine conveyance avoiding troubles due to electrostatic charges. An inner layer has a hundred times the electrical conductivity of the outer and core, which have higher tensile and abrasion resistance. The carbon is not too well dispersed, to keep particles in contact, and a wetting agent may be present.